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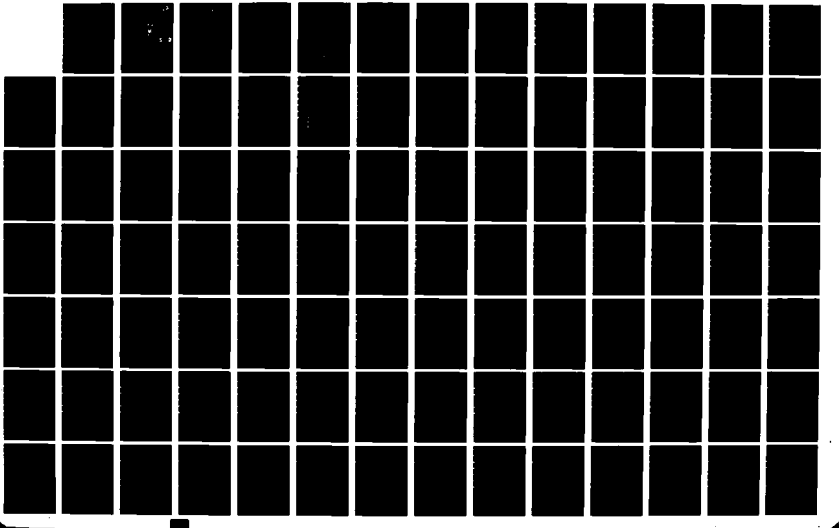

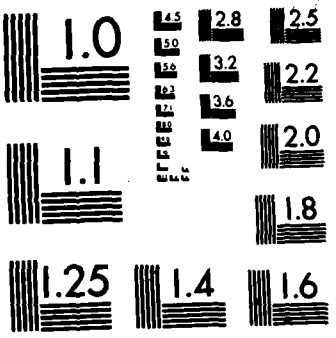

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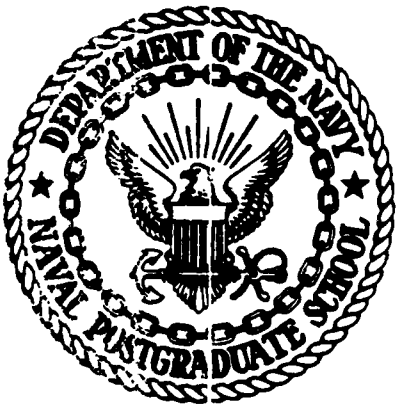

THESIS

ANALYSIS OF MANAGEMENT CONTROL TECHNIQUES FOR THE DATA PROCESSING DEPARTMENT AT THE NAVY FINANCE CENTER, CLEVELAND, OHIO

by

James William McGloon

March 1983

Thesis Advisor: K. J. Euske

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The Data Processing Department at the Navy Finance Center is presently undergoing a reorganization project which will eventually lead to the establishment of a service-oriented data center for pay and personnel purposes. Analysis and research were conducted to provide the Data Processing Department at the Navy Finance Center with information regarding effective and efficient management control system techniques. Both literature and field research uncovered management methods that have proven to be successful in the data processing managerial arena. Data centers in both the public and private sectors were sampled in an effort to

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identify current techniques utilized in the computer management field. Those techniques that stood out amongst others and might be considered feasible for future implementation at NFC included management by objectives, 3-5 year cycle and program planning, and project analysis studies performed at Hewlett-Packard Corporation.

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Analysis of Management Control Techniques for the Data Processing Department at the Navy Finance Center, Cleveland, Ohio

by

James William McGloon
Lieutenant, United States Navy
B.S., United States Naval Academy, 1975

Sumitted in partial fulfillment of the requirements for the degree of

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Author: James W. McGloon

Approved by: _____
Thesis Advisor

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Second Reader

_____
Chairman, Department of Administrative Sciences

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Dean of Information and Policy Sciences

ABSTRACT

The Data Processing Department at the Navy Finance Center is presently undergoing a reorganization project which will eventually lead to the establishment of a service-oriented data center for pay and personnel purposes. Analysis and research were conducted to provide the Data Processing Department at the Navy Finance Center with information regarding effective and efficient management control system techniques. Both literature and field research uncovered management methods that have proven to be successful in the data processing managerial arena. Data centers in both the public and private sectors were sampled in an effort to identify current techniques utilized in the computer management field. Those techniques that stood out amongst others and might be considered feasible for future implementation at NFC included management by objectives, 3-5 year cycle and program planning, and project analysis studies performed at Hewlett-Packard Corporation.

TABLE OF CONTENTS

I. INTRODUCTION

A. NAVY FINANCE CENTER, CLEVELAND, OHIO

The Navy Finance Center (NFC) is presently undergoing an organizational change which will have direct impact on the service it provides to all Naval personnel. The change calls for the replacement of the Systems Department at NFC by two major departments under the Information Systems Directorate: Systems Development and Data Processing [Ref. 26. p. 8]. The purpose of the research and analysis in this study is to provide information for the establishment of a useful and feasible management control system for the Data Processing (DP) Department, which is responsible for Automatic Data Processing (ADP) design and programming as well as operating the Navy's most modern computer center for financial systems [Ref. 26: p. 8]. Why the focus on the Data Processing Department? One of the primary reasons is that the Navy is consolidating the automatic data processing operations of the pay and personnel systems, and the DP Department will serve as a data center for both the pay and personnel functions. The Personnel and Pay Systems Consolidated Computer Center (PERSPAY) Program is an effort begun in 1978 to accomplish the consolidation of the data processing operations of the Naval Military Personnel Command (NMPC) in Washington, D.C. and the Navy Finance Center in Cleveland, Ohio.

The data processing operations of the Navy pay and personnel systems are being consolidated to synchronize the pay and personnel data bases. Currently, with the pay and personnel data bases located at separate sites, one organization receives information from the field. It then edits and enters the information into its data base. Next, it forwards the information to the other organization to be edited and entered into the other data base. After consolidation, the major data bases will be at the Consolidated Computer Data Center and the timeliness and accuracy of the exchange of information between the two data bases will be improved. The DP Department at NFC will become essentially a data center and will be responsible for the organization, management, and operation of the Consolidated Computer Data Center [Ref. 26: p. 5]. A means for managing and controlling the resources allocated for the establishment and operation of this data center is a subject of interest for data processing department managers at NFC. Management control is concerned with utilizing organizational resources effectively and efficiently to achieve established objectives. An effective management control system is required.

B. MANAGEMENT CONTROL

Management control is defined by Robert N. Anthony [Ref. 1. p. 17] as the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives. Effectiveness relates to the accomplishment of the organization's goals and objectives. When a specific desired end is obtained, the required action is considered effective.

Efficiency involves the optimum relationship between input and output. The efficiency of the machine or process increases as the units of output obtained from a given input increase [Ref. 1: pp. 27-28]

Management control takes place in an organization that already exists, that has goals, and that has decided on broad strategies for achieving these goals. Decisions on these goals and strategies are made in the strategic planning process. Strategic planning is external to management control but management control does contain a tactical planning phase based on the established strategic plan. Although management control is not strategic planning, the necessary interaction of management control and strategic planning often makes the distinction between the two quite difficult to distinguish.

Why is management control so important for an organization? Primarily, it is a method by which management given organizational goals and objectives establishes for the organization, first, what should be done and how it will be accomplished and, second, controls to assure the desired results are achieved. These methods and techniques are the subject of further discussion throughout this study.

C. RESEARCH METHOD

After establishing the topic of research for this study as management control in the electronic data processing arena, an extensive literature search was conducted in this area. Research material was provided by the Naval Postgraduate School library and computer center. Previous thesis reports involving management control were also researched.

Following the literary search, interviews were conducted with Naval Postgraduate School faculty members whose primary areas of expertise involved management and computer science. The primary purpose of these interviews was to gather additional information and to receive professional guidance regarding the proposed topic.

The next stage of the study consisted of field research conducted at five computer facilities. The facilities visited during this research were, NFC, Cleveland; Navy Regional Data Automation Center (NARDAC), San Francisco; Fleet Numerical Oceanography Center (FNOC), Monterey; Facilities Systems Office (FACSO), Port Hueneme; and Hewlett-Packard Corporation (HP), Palo Alto. The five computer facilities provided invaluable insight regarding the management of these organizations. The archival data relating to management control at each of these facilities was studied, and interviews were conducted with all levels of management. Concepts and techniques that were identified during the field research are discussed in the ensuing chapters.

D. ORGANIZATION OF THE STUDY

The organization of NFC and the Data Processing Department are the subject of Chapter II. The basic goals and objectives of NFC and the Data Processing Department are specified in an attempt to familiarize the reader with NFC's mode of operation.

Chapter III gives a basic overview of management control. Basic characteristics of management control systems such as organizational relationships, performance measurement devices, programming, budgeting,

and reporting in an environment such as NFC are presented to give the reader a basic idea of what an effective and efficient management control system should contain.

Chapter IV discusses existing management control techniques used by data centers and computer facilities included in the research. Management control techniques that were identified at these facilities are elaborated on in Chapter IV.

Chapter V takes those techniques from Chapter IV and attempts to show their applicability for NFC's Data Processing Department. The emphasis of the chapter involves suggested planning and control devices for operating a data center.

Chapter VI discusses possible recommendations and conclusions for the Data Processing Department at NFC and suggests areas that require further research for future thesis students.

II. ORGANIZATION OF THE NAVY FINANCE CENTER

A. INTRODUCTION

The purpose of this chapter is to present the overall organization of the Navy Finance Center (NFC) Cleveland, its mission, functions, and responsibilities. These are specified in the first two sections of this chapter. Next, the organization for military pay functions is presented. This section shows how NFC is organized into the three primary areas of operations, systems, and support to accomplish all military pay functions. The Data Processing Department within NFC is focused upon in this chapter as it is throughout this study. This is the next area of discussion. In this chapter, the organization, objectives, and general operational capabilities of the DP Department are specified. This chapter shows the current organizational alignment and characteristics of the department. The future movement of the department to an eventual establishment of a data center is described in Chapter V. Finally, the established objectives of the DP Department are delineated. These objectives serve as an aid for management to recognize and fulfill departmental responsibilities. The reference material for this chapter comes from two sources: Navy Finance Center Organization Manual and the Navy Finance Center Command Systems Presentation of 1982.

B. ORGANIZATION AND MISSION

NFC is primarily a service organi ·ion dedicated to ensuring that Navy members are paid accurately and on time. This is the dominant reason for the existence of this facility. NFC is a shore (field) activity falling under the command and primary support of the Deputy Comptroller of the Navy.

The mission of NFC is specified in their Organizational Manual as follows:

> ...plan, design, develop, implement and administer Navy active duty, retired, and reserve pay systems; perform examination, accounting, disbursing, financial reporting and local logistical and military support functions. Furthermore, the Navy Finance Center is charged with the responsibility of performing such other functions as assigned by the Deputy Comptroller of the Navy.

NFC's overall organizational scheme is depicted by Exhibit I. This diagram is a macro-view of the System. Each department is comprised of numerous and extensive parts. For instance, the DP Department, which is focused upon throughout this study, is made up of four distinct divisions that provide supporting services throughout the entire organization.

C. RESPONSIBILITIES

NFC is responsible for the development, design, implementation and maintenance of systems in order to effectively administer the Joint Uniform Military Pay System (JUMPS) for the Navy. Under the JUMPS system, NFC is tasked with a myriad of responsibilities which include the recording of installment accruals to provide monthly reports of obligations, disbursements and other related accounting, financial and statistical data required by the Comptroller of the Navy

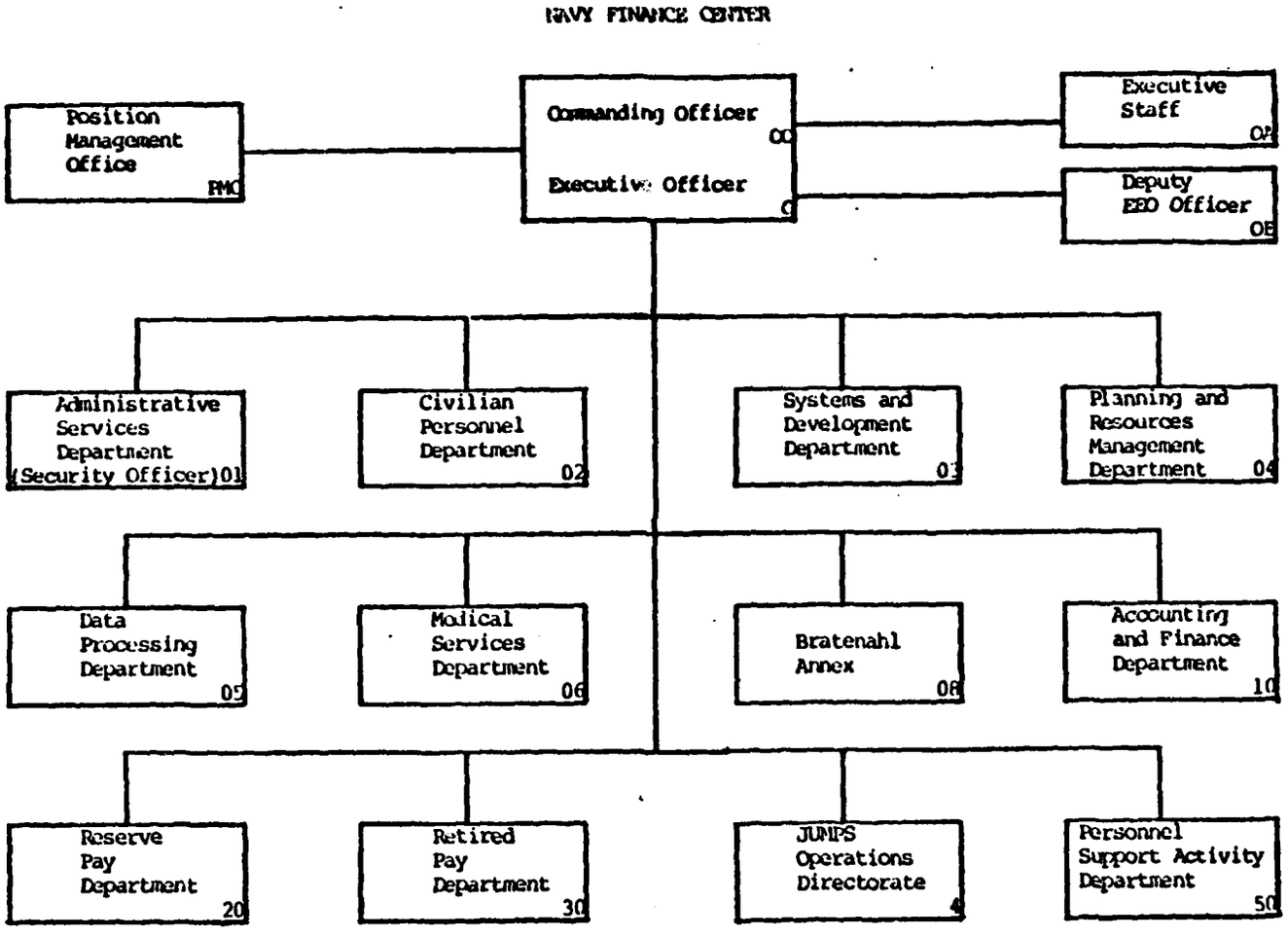
NAVY FINANCE CENTER
Position Management Office PMO
Commanding Officer 00
Executive Officer
Executive Staff
Deputy EEO Officer
Administrative Services Department (Security Officer) 01
Civilian Personnel Department 02
Systems and Development Department
Planning and Resources Management Department
Data Processing Department
Medical Services Department 06
Bratenahl Annex 08
Accounting and Finance Department 10
Reserve Pay Department 20
Retired Pay Department 30
JUMPS Operations Directorate
Personnel Support Activity Department 50

Exhibit I

(NAVCOMPT) and the Command, Naval Military Personnel Command (NMPC) for the Military Personnel, Navy (MPN) and numerous other budgetary functions.

The responsibilities of NFC also include the development and maintenance of a viable and responsive system to administer the centralized Navy Reserve Drill and Retired Pay Systems. This includes developing effective instructions, interpreting laws, administering regulations and preparing the necessary technical documentation pertaining to the entitlement and computation of active duty, reserve and retired pay.

As a central site for JUMPS processing, NFC receives and processes entitlement changes in order to compute a Navy member's pay, issues a Leave and Earnings Statement (LES), and furnishes financial reports to the Military Pay Appropriation managers. Active Duty Pay Accounts are established from information received from NMPC and are updated based upon information received from the field. NFC receives approximately 1.8 million transactions each month which concern active duty pay matters. More than 1,000,000 of these transactions involve the semi-monthly issuing of paychecks to over 540,000 active duty personnel.

JUMPS differs from Retired Pay in several ways. One of the important differences between JUMPS and Retired Pay is direct contact with the individual retirees who have no disbursing officer and are spread throughout the globe. Every month there are over 380,000 retiree and annuitant accounts that must be processed and issued a check by NFC. The volume of actions and complexity of the retired pay system poses an ever-increasing workload as the number of accounts grows and legislation proliferates.

The Reserve Pay Department provides monthly payments to over 80,000 reserves, NROTC students, and health professional scholarship students.

D. ORGANIZATION FOR MILITARY PAY FUNCTIONS

NFC is organized into three primary areas to accomplish the military pay functions previously mentioned. These three areas are Operations, Systems, and Support. This organizational alignment is displayed in Exhibit II.

1. Operations

One Directorate and four departments make up the Operations side of the organization. The JUMPS Operations Directorate is comprised of five departments responsible for active duty pay. Retired Pay and Reserve Pay Departments are responsible for pay systems implied by their names. The Accounting and Finance Department performs those accounting, payment and collection functions required by the system. The Accounting and Finance Department does not handle individual pay accounts. The Personnel Support Activity (PSA) Department provides personnel and disbursing service for local Navy active duty and reserve personnel. Eighty-eight percent of NFC's positions are devoted to the development, operation, and maintenance of the Navy's military pay systems. Nearly 75 percent of the 1200 personnel in this area are involved in the active duty JUMPS.

2. Systems

The second area of NFC's organizational alignment is comprised of two departments, Systems Development and Data Processing, responsible for the development, improvement, and maintenance of the three major

ORGANIZATIONAL ALIGNMENT

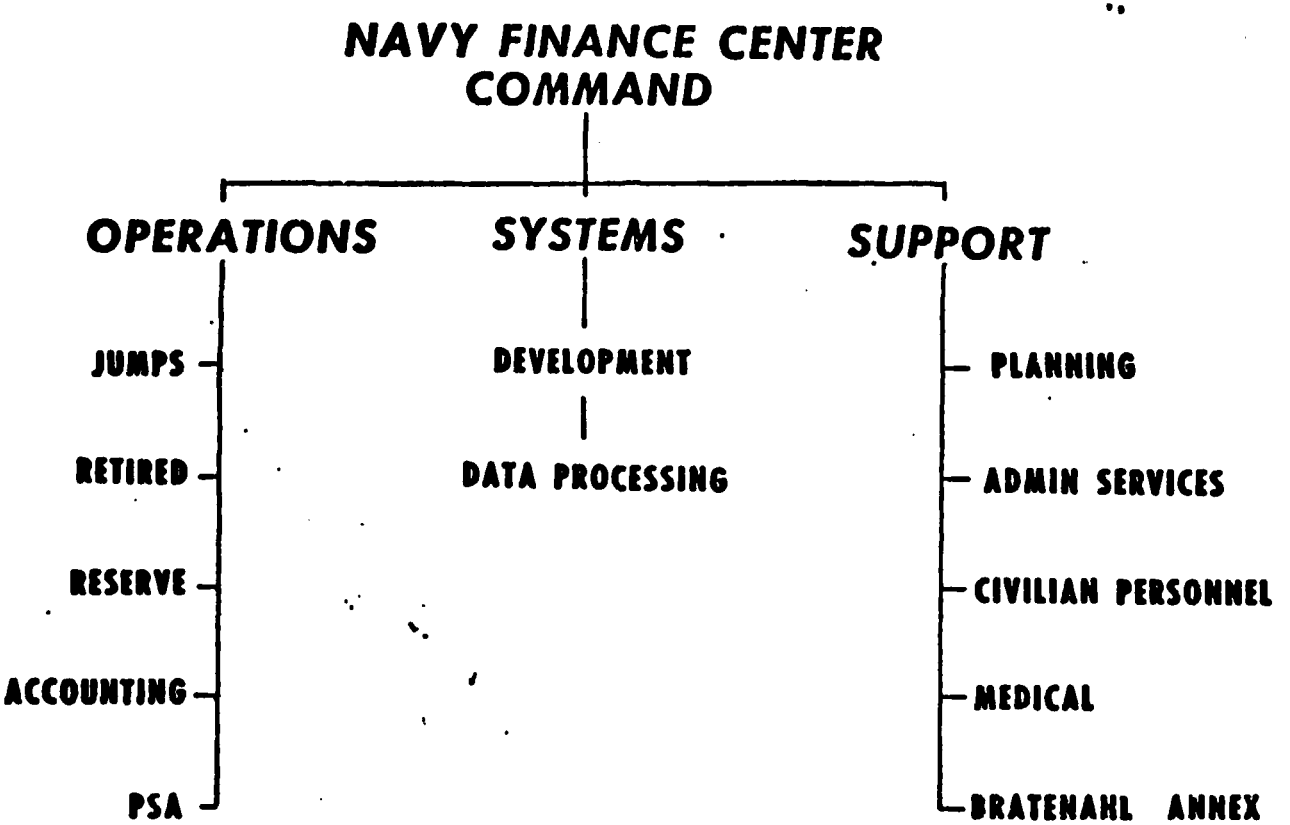

Exhibit II

military pay systems. The Systems Development Department is the focal point for the Navy Military Pay Systems. It develops long- and short-range system design objectives for existing Navy military pay systems and develops new pay systems based on the need to achieve design objectives. It is staffed with financial systems specialists who work closely with the Operating and Data Processing departments to ensure that the military pay systems of the center are effective, efficient and accurate. The Data Processing Department is responsible for the ADP design and programming as well as operating the Navy's most modern computer center for financial systems. The Data Processing Systems are comprised of over 2,200 computer programs with more than 2,000,000 lines of Cobol Code. Two IBM 370/158s coupled as a multi-processor plus one stand-alone 370/158 provide the major computer resource. Seventy-two IBM 3350-type disks capable of maintaining over 22.7 billion characters of data, together with 20,000 magnetic tapes provide the necessary storage for the vast master files and data processed. As part of the PERSPAY Program mentioned in Chapter I, NFC is presently undergoing a reorganization that calls for the disestablishment of the Systems Department to be replaced by an Information Systems Directorate with two major departments: Systems Development and Data Processing. This reorganization will allow system users to control their own destiny in determining priorities for system changes. It also establishes the organizational framework to accomodate an ever-increasing data processing responsibility and to provide a resource base for a project to enhance JUMPS system maintenance.

3. Support

The third primary area in NFC's organizational alignment is that of Support. This includes Planning, Administrative Services, Civilian Personnel, Medical and the Bratenahl Annex. The Bratenahl Annex will serve as the future home of the Consolidated Computer Data Center and provides a secure, comprehensive and modern data processing facility. The Planning Department combines the functions of the Comptroller, Internal Review, Information Management and Management Planning.

E. DATA PROCESSING DEPARTMENT

Vast amounts of information concerning military pay flow in and out of NFC on a daily basis. The need for rapid processing of such information in order to promote the effective and efficient operation of the organization is the responsibility of the Data Processing Department.

The Data Processing Department is supported by four divisions: Technical Support, Analysis and Programming (Inactive Pay), Analysis and Programming (Active Pay), and Operations. This departmental breakdown is pictured in Exhibit III. The Data Processing department head serves as the principal advisor to the NFC Commanding Officer and other NFC management officials on all technical ADP matters. The department operates an ADP service center in support of functions and projects assigned to and serviced by NFC. Responsibilities also include operating and evaluating installed Automated Data Processing Equipment (ADPE). Assigned departmental personnel analyze ADPE deficiencies, determine and justify procurement requirements, and monitor and

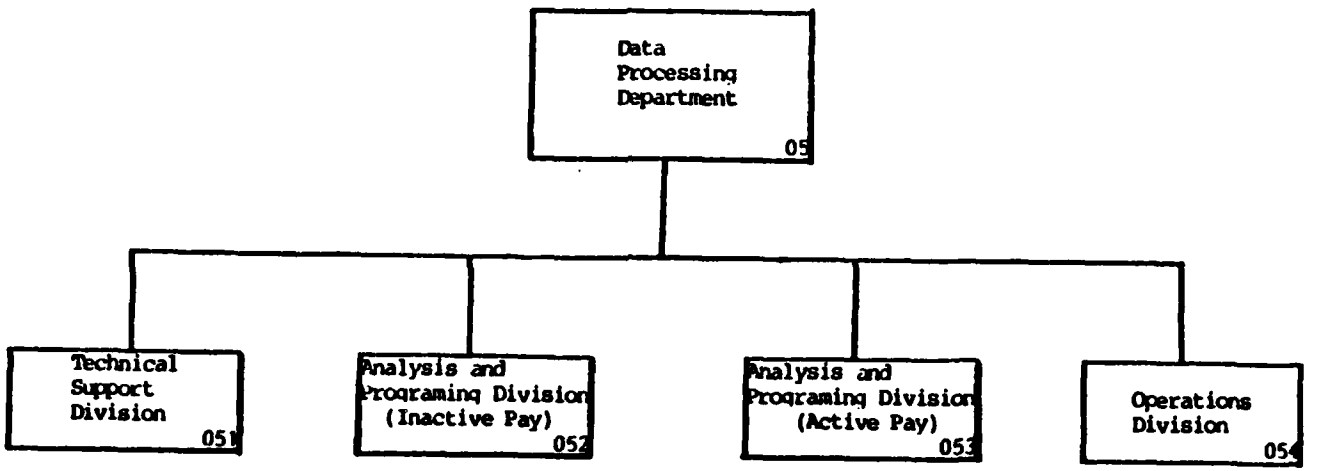
Data
Processing
Department
05
Technical
Support
Division
051
Analysis and
Programing Division
(Inactive Pay)
052
Analysis and
Programing Division
(Active Pay)
053
Operations
Division
054

Exhibit III

participate in ADPE procurement actions to meet future resource requirements and maintain the NFC ADPE configuration compatible with state-of-the-art developments. The Data Processing Department insures that the presently installed systems software is effectively utilized and that the department remains abreast of technical ADP developments in this arena. This aids them in determining procurement requirements and necessary internal development efforts to meet systems' software deficiencies and obtain enhancements. The department is capable of providing ADP analysis, design, programming and documentation for the development of new and the maintenance of existing automated systems. Any coordination regarding the acquisition of ADP services from a commercial source is a function of the Data Processing Department. The Data Processing Department provides ADP support not only to NFC but also to Navy Headquarters and other agency headquarters to ensure the best utilization of the existing and potential capabilities of assigned resources. Feasibility studies to determine the necessary plans and designs for customizing existing systems and interfacing NFC's systems with other existing systems also are included in the Data Processing Department's formidable responsibility package. All NFC training involving ADP facilities are provided by the Data Processing Department.

F. DATA PROCESSING DEPARTMENT OBJECTIVES

The Data Processing Department has established a group of eight objectives to assist the department with recognizing and managing their challenging responsibilities:

(1) Effective Planning - formal planning mechanisms for the future data center--both strategic and tactical

(2) Security - develop and implement a formal NFC Security Program

(3) Resource Management - get out of the reactionary mode and into the anticipatory mode with regards to future hardware and software requirements

(4) Personnel - develop managerial resources through education and training

(5) Customer Service - improve service both regarding accuracy and timeliness

(6) Personnel/Pay Merger - provide project coordination and planning to ensure effective execution

(7) Establishment of the Data Center - specify requirements and associated interactions to become a separate Data Center

(8) Efficiency, Economy and Effectiveness - operations must be geared to this mode of management

If the DP Department can successfully meet these stated objectives, their ability to provide necessary services and fulfill organizational responsibilities will be greatly enhanced.

As has been pointed out in this chapter, the Data Processing Department is essentially an autonomous unit within NFC. The Data Processing Department plays an important role in the successful functioning of NFC. The volume of daily business and the high-level focus associated with the Military Pay System dictates a Data Processing Department that will provide effective and flexible support to every department within NFC. The Data Processing Department should recognize

the future growth of the organization now in order to effectively plan to meet its demands.

An effective management control system is necessary to manage their resources and responsibilities. An effective management control system enables managers to use resources effectively and efficiently to accomplish the stated organizational objectives. This concept will be elaborated on in Chapters III through V.

The next chapter will provide a basic overview of management control. The purpose of Chapter III is to specify some of the methods and practices characteristic of a well-managed organization.

III. A BASIC OVERVIEW OF MANAGEMENT CONTROL

The purpose of this chapter will be to delineate management control practices and constraints characteristic of an effectively managed nonprofit organization. It is important to emphasize that this chapter presents a general overview of management control practices and that all sections of this chapter may not be applicable for the DP Department at NFC. Some of the managerial techniques mentioned in this chapter have already been implemented at NFC while some ideas discussed appear feasible for future utilization.

Nonprofit organization and its organizational relationships are discussed in the first two sections of this chapter. In the next two sections the management control structure and the management control process are defined and discussed. Following these two sections, one of the steps in the control process, programming, as described in more detail can be considered either part of management control or strategic planning depending on the perspective from which the process is viewed. The final section of this chapter describes strategic planning. Although strategic planning is not a part of management control, it is a necessary stimulus for an effective management control system.

"Management control is the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives." [Ref. 1: p. 17]. The primary intention of this definition of management control is to

convey three basic ideas. First, management control is a process that involves managers who get things accomplished by working with other people. Second, the entire process occurs within a context of objectives and policies that have been stipulated via the strategic planning process by top-level management. Third, effectiveness and efficiency are the standards by which the overall control process is to be judged. A vehicle for measuring the effectiveness of an organization has prompted the installation of various management control systems, both in the private and public sectors. Management control in the public nonprofit arena is emphasized throughout this chapter. Two works by Robert N. Anthony, Management Control in Non-Profit Organizations, co-authored with Regina E. Herzlinger, and Planning and Control Systems, A Framework for Analysis serve as general guides throughout this chapter.

A. NONPROFIT ORGANIZATIONS

With profit as an objective for an organization, the efficiency and effectiveness of an operation can be quite easily determined by excess of revenues over expenses. Unfortunately, this is not quite the case for a nonprofit organization that cannot use profit as a criterion for evaluating proposed courses of action and measuring overall performance. Management control techniques are hindered by the non-quantifiable nature of the output of the nonprofit organization. Managers and employees working within such a system should recognize this inherent shortcoming in evaluating the usefulness of their organization. The qualitative vice quantitative nature of many aspects

of the organization's output must be considered closely. Despite the difficulty associated with the measurement of the effectiveness of a nonprofit organization, this should not promote an attitude that management control is irrelevant. Rather, it should inspire management to design and implement the best possible control system possible. During this design process, consideration should be given to operational and organizational constraints. Since proposed courses of action cannot be judged in terms of how well they meet a profit objective, management must develop other criteria for deciding on such things as effective programs and budgets. This can be accomplished by establishing goals or objectives at the outset of a cycle and then measuring output in relation to these standards at the completion of the cycle. Possible methods for measuring output in a nonprofit organization are results measures, process measures and productivity measures [Ref. 2: p. 233]. These measures are further discussed in Section C of this chapter.

B. ORGANIZATIONAL RELATIONSHIPS

The success or failure of an organization's management control system is largely up to top-level management. In order to establish and sustain a good management control system, it is necessary that top management appreciates the importance of management control, recognizes that management control is feasible, understands how to use the management control system, and is willing to devote enough time to the management control process [Ref. 2: P. 579]. If top management merely pays lip service to management control and regards it as insignificant,

the control system will be ineffective and doomed to failure. Top management support and adherence to prescribed policies is critical to to management control and therefore to organizational success.

How is such a control system implemented and continually supported by top management? One method is the establishment of a strong governing body similar to a private sector board of directors. Some or all of its members should be willing to spend the necessary time both in examining program and budget proposals and in analyzing formal reports on performance and informal communication from clients and others as to how well the organization is performing [Ref. 2: p. 579]. Genuine interest and strong support of the system are prerequisites for an effective governing body [Ref. 2: p. 47]. In the performance of their duties, the governing body must be careful not to infringe too closely upon the prerogatives of management. In their staff function they should serve as an aid to management instead of a watchdog. The governing body should consider the suggestions of the line managers for they are the individuals most intimate with the operational characteristics and intricacies of the system.

Operating managers within nonprofit organizations should be given the authority to use their own judgment in determining how objectives are to be met. They must not lose sight of the fact that within a nonprofit organization, they must deal with more stringent constraints, especially budgetary, than is customary for their private profit-oriented counterparts. [Ref. 2: p. 60]

In the next two sections the concepts of management control structure and management control process are discussed. It is

important to distinguish the difference between the two ideas. Structure relates to how the management control system is organized. An example would be the departments that make up an organization. The process involves the actual operation of the system. This includes the necessary methods required to make the organization function and fulfill its responsibilities. Examples of these methods are programming and budgeting.

C. MANAGEMENT CONTROL STRUCTURE

1. Account Structure

An account is a device for collecting data about what is indicated by its title and as specified in the definition of what is to be collected. Accounts collect data on either inputs or outputs. They are used to collect both historical and estimated future data [Ref. 6: pp. 2-3]. A formal management control system normally contains two principal account structures: A program structure, and a responsibility structure. Both of these structures are interrelated.

a. Program Structure

The program structure contains information on the programs that the organization undertakes or plans to undertake. The program structure should be arranged so that data collected in the program accounts are useful for three principle purposes:

(1) To make decisions about the programs that are to be undertaken and the amount and kind of resources that should be devoted to each program;

(2) To permit comparisons of the costs and outputs of similar programs carried on by several organizations;

(3) To provide a basis for setting fees charged to clients or for reimbursement of costs incurred [Ref. 2: p.84].

b. Responsibility Structure

The second principal way of classifying information is by responsibility centers. A responsibility center is a unit of an organization headed by a manager who is responsible for what it does. Information classified by responsibility centers is used for planning the activities of responsibility centers, coordinating the work of the responsibility centers in an organization, and controlling the responsibility center manager [Ref. 2: p. 7]. There are four principal types of responsibility centers:

(1) Expense Centers. If the management control system measures the expenses incurred by a responsibility center but does not measure the monetary value of the unit's output, the unit is an expense center. (NFC personnel may be more familiar with cost centers. Cost centers are utilized at many Navy establishments and are operated in the same manner as an expense center.) The authority and responsibility of the managers of expense centers therefore is restricted to the planning and control of expenditures and costs. While revenue may also be generated by an expense center, it is incidental and of secondary importance [Ref. 7: p. 470]. Although every responsibility center has outputs (i.e., It does something.), in many cases it is neither feasible nor necessary to measure these outputs in monetary terms. In many nonprofit organizations, all the responsibility centers are expense centers. For these, the accounting system records expenses incurred, but not revenue earned.

(2) Profit Centers. Revenue is a monetary measure of output; and expense is a monetary measure of input, or resources consumed. Profit is the difference between revenue and expense. Thus, in a profit-oriented business, if performance in a responsibility center is measured in terms of both the revenue it earns and the expense it incurs, the unit is called a profit center. Therefore, managers of profit centers are charged with planning and controlling both revenues and most related expenses [Ref. 7: p. 471]. Although profit is not an objective of nonprofit organizations, responsibility centers which charge fees for services provided to clients are often designated as profit centers. In this case, revenues earned from services should approximately equal the value of those services.

(3) Revenue Centers. Revenue centers are responsible for generating services or products which will produce a target level of revenue [Ref. 2: p. 579]. The amount of revenue generated is the primary concern of this responsibility center. Expenses incurred in the process are considered but to a lesser degree than revenues. In many nonprofit organizations, it is difficult to match expenses incurred in the delivery of services to revenues that support those services.

(4) Investment Centers. In an investment center, the account structure measures not only profit but also the capital employed in generating that profit. An investment center can then be thought of as a profit center that has authority over and responsibility for investment decisions relating to capital assets. In practice,

the investment center concept is rarely used in nonprofit organizations [Ref. 7: p. 471].

(5) Mission Centers and Service Centers. In addition to the four principal classifications, it is also useful to classify responsibility centers as either mission centers or service centers. The output of a mission center contributes directly to the objectives of the organization [Ref. 1: p. 80]. The output of a service center contributes to the work of other responsibility centers, which may be either mission centers or other service centers; its output is thus one of the inputs of these responsibility centers.

A service center can be either an expense center or a profit center. Its objective is not to make a profit, but rather to break even. The extension of the profit center idea to service centers is relatively new, especially in nonprofit organizations. The service center concept should only be used in organizations where service costs are significant. When the account structure is set up properly, it can provide a powerful instrument for management control.

c. Relationship of the Program and Responsibility Structures

When responsibility centers work on more than one program it is necessary to utilize both the program structure and responsibility structure as described above. However, when responsibility centers in an organization work solely on one program, then the program structure corresponds to the responsibility structure. In this simple case, it is not necesesary to develop a separate program structure with different labels than those of the responsibility centers.

2. Accounting System

Similar to the requirements of profit-oriented organizations, the accounting system used by nonprofit organizations must be capable of collecting data to be used in both management reports and general purpose financial reports [Ref. 4: pp. 51-53].

a. Management Reports

Management accounting reports should focus on the extent to which the organization has operated so as to maintain its operating capital. In order to do this the system measures the revenues earned and the expenses incurred during an accounting period.

Revenues in nonprofit organizations arise from the sale of goods and services; from membership dues; from taxes, contributions, grants, endowment earnings, and appropriations that are used for operating purposes.

Expenses measure the resources used in operations during a period. They decrease the organizations equity. The accounting system in a nonprofit organization should measure spending for programs and by responsibility centers in terms of expenses, rather than in terms of expenditures, because expenditures measure resources acquired, which does not necessarily correspond to resources used. Expenses include the total cost of the resources used [Ref. 7: pp. 32-33]. In small nonprofit organizations, where the difference between expenditures and expenses is insignificant, it may be more practical and cost effective to treat expenditures as expenses.

Most expenses recorded in management reports are measured according to the same principles that govern financial reporting, but

in more detail. They are collected both by responsibility center and by program element. For responsibility center reporting, it may be necessary to measure only direct costs and to omit allocated costs. Controllable expenses are normally identified separately from noncontrollable expenses, but both types are reported [Ref. 11: p. 23].

b. General-purpose Financial Reports

In addition to the accounts needed for management control purposes, the accounting system must be able to collect the data needed for general-purpose financial reports prepared for outside parties. The most important financial statement is the operating statement. Its center purpose is to show the extent to which the organization operated so as to maintain its operating capital, that is, so as to be viable. In order to focus on operating results, operating revenues are reported separately from contributions of permanent capital, that is, gifts, grants, appropriations or other resource inflows whose use is intended for construction of plant or for other nonoperating purposes. The DP Department at NFC must also be concerned with general-purpose financial reports in order to justify operating expenses and future procurements.

c. Other Accounting Information

In addition to management and general-purpose financial reports, outside agencies may require reports prepared according to requirements that they specify. These reports may or may not be useful to the management of the organization that prepares them. Ideally, the information these special-purpose reports give should be summaries of the information contained in the management control system because

outside agencies presumably do not need more, or different, information from that which is useful to management [Ref. 11: p. 51].

3. Output Measurement

A nonprofit organization does not have a way of measuring output that is comparable to the revenue, gross-margin, or net-income numbers that are routinely available in a business enterprise, nor can it hope to develop a nonmonetary measure that is as good as these measures. However, it needs the best possible substitute that can be feasibily devised; because without some reasonable measure of output, there is no way of assessing either the efficiency or the effectiveness of the organization's performance [Ref. 12: p. 43]. The well-managed, nonprofit organization, therefore, devotes considerable attention to developing satisfactory output measures. It recognizes that although output measures are of limited validity, they are better than nothing. Since output should be related to an organization's objectives, it is essential, as a first step, to try to state the more important objectives in quantitative terms if at all possible.

Output measures are normally in one of two categories: Results measures, which indicate the organization's performance in accomplishing its objectives; or process measures, which indicate the quantity of work done. If one of NFC's objectives is to assure that Navy personnel are paid accurately and on time, an example of a results measures would be to determine exactly what percentage of all Navy personnel were not paid properly last month. This could be accomplished by determining the number of legitimate claims made

regarding incorrect payments. Reliable-results measures are likely to be more difficult to devise than process measures, but they are of more significance to higher level management. Process measures are relatively easy to identify and are of more use in the measurement of current, short-run performance. An example of a process measure would be the number of payment claims processed by an individual in a month. The essential difference between a results measure and a process measure is that the former is "ends oriented" while the latter is "means oriented" [Ref 2: p. 233]. The management control system should include an appropriate mix of both types of measures. A third type of output measure is the social indicator. A social indicator is a broad measure of output which broadly identifies results of the work of the organization. It is of relatively little use in management control because few social indicators can be related to the work of a single organization but instead are affected by forces from many sources [Ref. 2: p. 57]. An example of a social indicator for Navy morale is reenlistment rates. They may be useful in long-range planning, provided that the governing board and management recognizes its limitations; at best, it is a rough measure of performance.

A measure of the quantity of output is more reliable and easier to develop than a measure of the quality of output, but a well-managed organization does not permit this fact to lead to an overemphasis on quantity. Quality must be controlled, even though its measurement is subjective. The notion that the search for good output measures is hopeless because output cannot be measured perfectly should be rejected. There should be a continuous search for new, more valid

measures. At the same time, the limitations of existing output measures should be recognized [Ref. 14: p. 195]. Finally, only those output measures that are useful in the management control process should be collected. Unfortunately, these measures are often determined by the trial-and-error method.

D. THE MANAGEMENT CONTROL PROCESS

A management control process is associated with an organization that has established goals and has ascertained the required strategies for achieving these goals. Although a good portion of this control process is informal, most organizations have developed a formal system to assist in the daily operations of the firm or agency. The information in this system consists of (1) planned and (2) actual data on both outputs and inputs. Prior to actual operations, decisions and estimates are made as to what outputs and inputs are to be; during actual operations, records are maintained as to what outputs and inputs actually are; and subsequent to operations, reports are prepared that compare actual outputs and inputs to planned outputs and inputs and action is taken on the basis of these reports [Ref. 21: p. 14].

A formal management control process is comprised of four critical segments: (1) programming, (2) budgeting, (3) operating and measurement, and (4) reporting and analysis. Each of these segments is extremely interdependent and together they constitute a closed loop.

1. Programming

The programming process includes both the formal system for deciding on the overall mix of activities for an agency and the tools

reports should essentially compare planned outputs and inputs with actual outputs and inputs.

E. PROGRAMMING

Unless an organization continues with the same activities, year after year, it must have a procedure for generating ideas for new programs, analyzing these programs, reaching a decision on these programs, and incorporating the approved individual programs into an overall plan. This is the programming process [Ref. 2: p. 584].

Programming is a unique method concerned with the future growth and direction of the organization. It serves as the link between strategic planning and management control. Programming is used as a method of planning the organizational activities generally for a 3-5 year period. These programs must be consistent with organizational goals and should serve all levels of the organization in achieving established objectives. The 3-5 year planning-cycle process, that is discussed more extensively in Chapters IV and IV, is synonymous with the programming process.

F. STRATEGIC PLANNING

Although strategic planning falls outside the realm of management control, it is a relevant concept for any organization and stimulus for the management control process

Strategic planning is characterized by such terms as policy formulation, goal setting, and top management planning. Strategic planning is defined by Anthony [Ref. 1: p. 16] as follows:

> Strategic planning is the process of deciding on objectives of the organization, on changes in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use, and disposition of these resources.

Strategic planning is necessary for an effective management control system because it serves as a means for top-level management to express their desires concerning the operating policies of the organization. The word "strategy" implies looking at the overall picture, assessing it, and making plans for the future movement of the organization. If top management fails to adopt this futuristic attitude and instead limits itself to the current situation, the organization's chances for growth are limited and the entire control process is insignificant.

IV. MANAGERIAL AND CONTROL TECHNIQUES UTILIZED IN THE FIELD

A. INTRODUCTION

In concert with literary research conducted during the course of this study, several installations utilizing computer and electronic data processing resources were visited in an effort to ascertain the applicability of existing management control theory to real-life operations. Of the four facilities visited, three were U.S. Navy installations while one was a privately owned company. Both Navy and private sector organizations were selected in an attempt to provide some insight regarding managerial techniques employed in both the private sector and the U.S. Navy. The U.S. Navy facilities that furnished information were the Facilities Systems Office (FASCO) located at the Naval Construction Battalion Center, Port Hueneme, California; the Fleet Numerical Oceanography Center (FNOC), Monterey California; and the Navy Regional Data Automation Center (NARDAC), San Francisco, California. The private company that participated in this research was the Hewlett-Packard (HP) Corporation of Palo Alto, California.

The primary aim of this chapter is to focus upon several of the managerial and control techniques utilized by these four organizations. Starting with the private sector organization, Hewlett-Packard, their Management by Objectives (MBO) philosophy is described, Hewlett-Packard planning techniques are discussed, and the Segmented Documentation

Methodology (SDM) used by Hewlett-Packard is explained. Then FASCO's Five-Year ADPE Plan is presented. Finally, the ideas developed at FNOC for a Long-Range Electronic Data Processing (EDP) Plan are discussed. Although NARDAC, San Francisco provided useful research information, no specific NARDAC techniques are elaborated upon due to similarity with FACSO and FNOC management and operating characteristics.

These techniques are offered as possible methods for management and control for the DP Department of NFC, Cleveland. Specific application of these techniques to the DP Department at NFC is contained in Chapter V.

B. HEWLETT-PACKARD CORPORATION

Hewlett-Packard Company has been in operation for nearly forty years and has grown to become one of the largest companies in the world with annual sales of over 2.5 billion dollars [Ref. 30: p. 3]. Their product line is diversified, primarily involving electronic technology, catering largely to manufacturing-related industries. Hewlett-Packard manufactures more than 4,000 products, employs more than 50,000 people throughout the world and experiences approximately 20 percent growth per year [Ref. 30: p. 4]. With the magnitude and diversification of operations, a well devised management system is critical. Due to the size and growth of the corporation, Hewlett-Packard is oriented toward decentralized management responsibility at the operating level with strong central management coordination. Local management is accustomed to making their own decisions and reporting

to corporate management on a frequent and detailed basis [Ref. 30. p. 4].

Hewlett-Packard can be characterized as an organization whose innovative managerial techniques and policies have led to their success [Ref. 30: p. 7]. One of these techniques or policies that is found throughout the company, from President on down, is MBO. Although MBO is not a relatively new managerial technique (Drucker, 1954), it nonetheless remains the primary standard of management at Hewlett-Packard. MBO at Hewlett-Packard is practiced in an attempt to leave the decision making process to those who are closest to the problem [Ref. 17: p. 89]. For Hewlett-Packard, this means that the operations and support systems must be decentralized.

1. MBO at Hewlett-Packard

At Hewlett-Packard, the efforts of the organization are directed toward the accomplishment of well-defined objectives. The achievements of the company are the results of the combined efforts of each individual working toward these common objectives. The company as a whole is driven by a set of seven corporate objectives, and the objectives of each division, department, and individual unit are derived from these seven objectives. Though these objectives are not important per se, it is important to understand that organizational policy and standard setting is established through these objectives. [Ref. 17: p. 12]

The primary assumption behind management by objectives is that the best results will be obtained if individual employees are given a clear understanding of the objectives they should work toward and the

freedom to work toward these goals in ways they consider most prudent [Ref. 17: p. 13]. According to the HP management manual, this is what MBO means to Hewlett-Packard managers. MBO offers a great deal of opportunity for individual freedom and contribution but requires individuals to use their initiative to achieve the expected results. Hewlett-Packard aspires to foster initiative and creativity by allowing the individual great freedom of action in attaining well-defined objectives [Ref. 17: p. 13].

There exists a hierarchy of objectives. As mentioned previously, the objectives for a manager in a division or region are derived from the corporate objectives as well as the divisional or regional objectives. The objectives are set sequentially. The corporate objectives are established initially, and these are used as a framework within which objectives at the divisional or regional level are determined. Once the divisional or regional objectives are generally agreed upon, the objectives of each function and department are developed. These, then, essentially determine the objectives for each manager at the first-line level. This concept of management was recently emphasized by Hewlett-Packard's Chairman of the Executive Committee, Bill Hewlett:

> ...I think there's a lot of misunderstanding about what is meant by management by objectives. First, I'll tell you what it isn't. It is not anarchy. It does not mean everyone has the right to make an independent decision regardless of how it affects anyone else. None of these decisions can be made in isolation. There's always two sides to it. There's how it affects your particular group and how it affects the people around you. It's the responsibility of people to not only consider their own objectives but how they fit in the total program.... [Ref. 17: p. 12]

For the Hewlett-Packard manager there are two key aspects to MBO. First, employees should be encouraged, as much as possible, to participate in establishing the objectives for their respective area of responsibility. The objectives established by the manager with a particular employee are largely determined by the objectives set by the divisional, regional, and functional management teams. However, there is quite often an opportunity for employee input regarding certain objectives or methods to reach these objectives [Ref. 17: p. 13]. According to a recent quote attributed to John Young, President of Hewlett-Packard, there are two kinds of objectives that can be established.

> ...Through this 'top-down' negotiation, there comes a context for the supervisor, certain things he has to get done. There's a certain turning of the handle kind of objectives which you usually don't spend too much time on, like the production schedule, things that are just expected to be done. The things that you spend most of your time on are the over-and-above objectives that maybe renew the system or add something new, like getting a new production control system in place. These are the things that have to be worked out individually.... [Ref. 17: p. 13]

It is in the establishing of the "over-and-above objectives" and in devising a means for accomplishing them that the managers and their employees have a great deal of latitude. Second, a manager should discuss with each employee those specific results that are expected over a distinct time frame and how their performance on a given objective will be measured. Clarity is essential regarding these established expectations in order to ensure employees understand and accept these criteria for measuring performance at the time the objective is specified.

At Hewlett-Packard the primary intentions of MBO are to allow management and employees a great deal of freedom in deciding upon work-group objectives as well as in determining how those objectives will be reached. Stripped down to its barest fundamentals, MBO says that a manager, given the proper support and guidance, is probably better able to make decisions about the problems he or she is directly concerned with than some high-ranking executive [Ref. 17: p. 14]. Although Hewlett-Packard feels this system places great responsibility on the individual concerned it also makes that individual's work more interesting and challenging. It makes the employee feel part of the company by having a direct effect on its performance.

2. Planning at Hewlett-Packard: A Basic Task of Management

At Hewlett-Packard, planning is considered one of the most critical responsibilities of any manager. An essential capability for any Hewlett-Packard manager is being able to fight off the day-to-day pressures and to think about the needs of the future. There exists no "off season" at Hewlett-Packard to think about where you went wrong, what you need to do better, and where you want to be two years from now [Ref. 17: p. 27]. This is an ongoing task that requires continual attention. Effective managers force themselves to do this. Without this ability, the managers might achieve immediate short-term objectives, but may not focus on good long-run performance.

At Hewlett-Packard, there are two types of planning considered most important to any manager: Position planning and tactical planning [Ref. 17: p. 28]. First, position planning involves analysis to determine the purpose of a job and the product or service

the job should provide. Tactical planning is a short-term plan of operations for a department or unit. Each requires managers and their employees to respond to several basic questions.

With position planning, the first question to answer is. "Why does a particular job exist?" The first step in position planning is to describe the position objective, which is a statement of the primary results a position is intended to accomplish. These results are usually stated in terms of the purpose of a job, the product or service the job should provide, the customer or client where applicable, and the scope of the job.

The second question posed in position planning is, "What does the job involve?" Here the major job responsibilities which must be accomplished are defined in order to achieve the position objective. This involves listing both the major management and vocational responsibilities and prioritizing them in terms of importance. What are the specific functions you should perform? What are your areas of accountability? Here the manager should select out of the many functions he or she might perform those critical few which the manager identifies as having the most direct effect on the organization.

The third question that should be answered in position planning is, "How well must each responsibility be performed?" After identifying the major responsibilities of the job, a manager must establish performance measures for each area of responsibility. Performance standards are the long-term results which must be accomplished and these should be stated, as much as possible in measurable terms. Where feasible, performance measures should be

stated in terms of the expected quality of the results, the quantity of results, or the limiting factors such as time or cost. If the results cannot be stated in quantifiable terms, state the results in terms of the specific conditions that will exist when the responsibility has been carried out. In most cases, performance can be measured accurately, and both the organization and individual benefit from such a system.

Following position planning, the tactical plan is integrated into the process as the second step. The tactical plan is a one-year game plan for the manager's department or unit. It is an outline of the major tasks the manager plans to accomplish during the coming year and serves as a primary measuring stick for the manager's annual performance. Tactical plans are prepared annually and are derived from the division's or region's long-range strategic plan. Tactical plans are often reviewed and revised at mid-year with additional detail added for the second half [Ref. 17: p. 29].

As with position plans, compiling a tactical plan requires the answer to three basic questions. First, "What results are expected over the next year?" The first part of a tactical plan is a specific goal statement. The goals statement should be derived from the position objective and major responsibilities described in the position plan. There are different types of goal statements. Some describe ongoing, routine responsibilities while others may describe problems intended to be solved or perhaps an innovation to be made. This kind of goal comes from comparing actual performance to desired performance.

The second question that should be answered in the tactical plan is, "How will these goals be accomplished?" Tactical planning provides an opportunity to develop action plans which specify the actions required to achieve each goal. These plans may also specify the action steps involved as well as the schedule, budget, the people who are accountable, and the dates for review. Specific action plans are particularly useful when several people are working on a project in that it helps the employees agree on desired outcomes and work plans prior to embarking on a particular task [Ref. 17: p. 30].

The third question that needs answering is. "How will these plans be evaluated?" The completion date for each goal or specific action plan should be included in the tactical plan. In addition, periodic reviews should be conducted to discuss progress related to predetermined goals [Ref. 17: p. 30].

The tactical planning process starts with the division or regional tactical plan prepared by the general manager and his or her staff. As the plans flow down through the organization, employees review the plans prepared by their managers. If individuals see an opportunity to improve their plans, they should discuss that point with their managers in an attempt to achieve mutual satisfaction and commitment. In this way. each individual participates in setting the objectives of the next higher level, not by a democratic process but by the opportunity to be heard. The ultimate decision must be made by the manager.

The process is altered to some degree as employees establish specific action or work plans for their groups, consulting with their

teams and then reaching agreement with the manager. The end result is a thorough operational plan for the year ahead where each employee understands and is committed to the role agreed upon in achieving the goals previously established.

The effective manager uses position and tactical planning to clarify job responsibilities and performance standards for each employee in the work group and to focus the group's efforts toward the accomplishment of well-defined objectives.

Further amplification regarding planning and control for a data center is offered in Chapter V. In an article on planning and control written by Mr. Phillip C. Cross [Ref. 5], many of the planning and control techniques necessary for the effective operation of a data center are enumerated such as methods of performance measurement, utilizing a plan of action and milestones guiding and adjusting performance, and the usefulness of a planning and control checklist. In Chapter V, the applicability of the specific planning and control methods identified by Cross that could be utilized by the Data Processing Department at NFC during their transition from a data processing service department to a data center are discussed. Chapter V also focuses on several of the planning methods mentioned in this chapter.

3. Segmented Documentation Methodology

a. Introduction

SDM is a comprehensive management technique employed at Hewlett-Packard to aid in the development of or modification to any operational system within the company. SDM is a means for ensuring

that proper documentation accompanies the development or improvement of any information system at Hewlett-Packard. It is a systematic approach that emphasizes standardization. This makes it easier for technicians, users, and managers to fully investigate and understand all required details when an information system is being designed or improved. SDM allows for documentation to take place concurrently with conception, analysis, and design phases of information system development. It involves both the users and managers during the crucial early stages of development while providing a basis for project costing, scheduling, and control. SDM also provides standardized forms that enhance system compatability [Ref. 18: p. 7].

As the system development process rolls through the initial design phases, each task is punctuated with SDM documents. Each document contains a greater amount of detail than the preceeding one and serves as a point of departure for the next document. It also serves as a point of interaction between the user and the other review levels of management (executive, middle and line managers). The availability of an end-document at each of the development tasks also provides an effective basis for project control and management. The basic procedures are useful for the first-time user or for people from different backgrounds who must work together. In any project where a new system is being designed or an existing system is being improved, SDM aids the planners, the technicians, and the managers [Ref. 18: p. 7].

SDM is flexible and can be adapted to fit a big or small project. Furthermore, since it is a systematic approach, it is

applicable to information systems whether they are manual, automated, or a combination of the two.

b. Main Features of SDM

SDM includes a number of features that collectively contribute to the entire process of development work and control of such efforts. These features are briefly outlined below [Ref. 18: p. 9]:

(1) Standard Documentation.

- Provides documents for each phase
- Provides a master table of contents so that each document is an expansion of the preceding one
- Each document is pre-structured and formatted
- Aids in defining the system framework and requirements
- Provides pre-formatted forms for all levels of documentation

(2) Documentation Structure Flexibility.

- Provides the project team flexibility to add new sections as well as omit the inapplicable ones within the pre-structured format of each document
- Provides for minimum standard documentation for projects of short duration

(3) Design Stability.

- Provides the basis for evolving the design in discrete and well-defined segments

(4) Integrated Testing.

- Provides the means of integrating the testing and design process

(5) Management Involvement.

- Provides for an understandable channel of communications between users and data processing

(6) Cost and Schedule Estimating.

- Provides a discipline whereby both costs and schedules are committed only for the next end-document or phase and estimated for all subsequent phases

(7) Project Control.

- Provides all the necessary reporting forms to inform both EDP and user management on the progress of the project in terms of cost and schedule commitments

c. The SDM Development Process

The information systems development process is the same process by which a new product, building, or almost any other item is designed and constructed. They all use SDM as a guideline. The SDM development process has four specific phases, each of which can be applied to any development project at Hewlett-Packard.

The SDM development process is outlined below:

(1) Phase I - Study.

- User oriented and used for interfacing with user departments and review committees
- Tasks/documents

(2) Phase II - Design and Implement.

- Technically oriented and used internally by EDP personnel
- Tasks/documents

(3) Phase III - Evaluation.

- User oriented for system evaluation
- Tasks/documents
- Post-implementation review

(4) Phase IV - Operate and Maintain.

- An important process for a successful system development program

An example of a Hewlett-Packard SDM study is provided in Appendix A, and demonstrates the role of SDM in the development of Hewlett-Packard information systems. No further elaboration concerning

SDM will be provided in this chapter but the reader may refer to Appendix A for further amplification on SDM.

C. FACILITIES SYSTEMS OFFICE

1. Background Information

Facilities Systems Office (FACSO) located at Port Hueneme, California is a Navy service facility that provides computer and data processing support for the Naval Facilities Engineering Command (NAVFAC) Headquarters, Engineering Field Division, Construction Battalion Centers, Public Work Centers, and Civil Engineering Laboratory. FACSO provides ADP systems design, implementation, and operational support with direct data communication linkage to the facilities mentioned above. ADP support encompasses the equipment, material, and personnel to operate and maintain fifteen interfacing automated information systems. To give a general idea of FACSO's workload in providing services to their various "clients". the FACSO computer averages 675 hours of operation per month. This is an average of 22.5 hours of computer time per day seven days a week [Ref. 9: p. 40]. The workload has continued to grow and has necessitated extensive planning to meet the service requirements of the future. How does FACSO accomplish this? Primarily by means of a five-year ADPE plan [Ref. 9]. All the information contained in this section has been taken from the FACSO Five-Year ADPE Plan of 1981. Several aspects of the plan are presented in an effort to explain the existence of and expose the need for such a managerial tool.

2. FACSO's Five-Year ADPE Plan

FACSO's Five-Year ADPE Plan details the needed ADPE upgrades and replacements over a five-year period to ensure FACSO meets the predicted increased-workload demands and the commitment toward data processing. It serves as a vehicle to justify equipment procurements based on the expansion of required services. The five-year plan also enables managers to initiate equipment procurement in a timely manner which can preclude costly delays. This plan is updated on an annual basis and is used as a basis for future equipment budgeting and planning.

The role of FACSO in providing ADP services to NAVFAC is planned to change over the next decade [Ref. 19: p. 1]. This change will come about through advances in equipment technology that will affect the concept of centralized ADP services. Development of distributed data processing applications at the remote sites of FACSO's clients will become a reality within the next few years. Growth in on-line telecommunications processing for data entry/query will escalate as increased processing demand is placed on the central-site computers at FACSO.

The purpose of the five-year plan is to establish a cohesive and phased implementation of various ADP technologies and disciplines over the next five years. Specifically, this document presents a five-year ADP plan affecting all NAVFAC users of data processing services. Major attention is given to current and increased future workload demands with an analysis of ADP technologies available in the

market place and how these technologies could be used to meet FACSO's expanding needs.

Primary subject areas of the plan include workload analysis and computer capacity projection; FACSO's present operating environment; current problems; strategic goals including central site ADPE, telecommunications support, and distributed processing, an overview of current and future technologies; and proposed implementation plans involving equipment and software requirements and economics. The report is broken down in a systematic fashion which enables the managers to focus on current as well as future problem areas, feasible enhancements, and developing technologies. It compels FACSO managers into the anticipatory mode by impressing upon them the need to recognize the magnitude of future commitments and the resources required to satisfy these demands.

This document outlines a five-year central site ADP growth plan for improving the performance and services offered by FACSO and establishes a firm basis for future operations. Emphasis is placed on the upcoming fiscal year with respect to action items and budgetary requirements. In that the plan also addresses the next four fiscal years of operation, it requires forecasting future conditions that are often difficult to estimate Therefore, action items are established at critial stages to review the progress/experience gained and to make needed adjustments. This approach establishes a basic action plan for making strategic decisions over a five-year period and should also provide the most accurate information at hand when key milestones are achieved. For the plan to remain viable, it is updated on an annual

basis, reporting on the progress to date and establishing a new fifth year of requirements [Ref. 9: p. 2].

FASCO reflects a state-of-the-art computer center that provides services and capability comparable to most Navy and commercial service-center operations [Ref. 9: p. 5]. If FASCO, or any other Navy ADP service center, is to maintain this posture of service and capability, planning must be initiated to keep one step ahead of the lengthy lead times for budgetary programming and higher level approvals for acquisition of software and hardware. For FACSO, the five-year plan serves this purpose.

Although a copy of FACSO's Five-Year ADPE Plan is not made available in this study, copies may be requested from FACSO at Port Hueneme, California.

D. FLEET NUMERICAL OCEANOGRAPHY CENTER

1. Background Information

The Fleet Numerical Oceanography Center (FNOC) located in Monterey, California is a U.S. Navy shore activity whose primary function is to provide operational oceanographic and atmospheric support, including ocean acoustic services, to U.S. military activities, other U.S. government agencies, and elements of the Armed Forces of allied nations. FNOC is also tasked with the development and testing of numerical techniques to solve oceanographic, analytical, and forecasting problems as directed by the Commander Naval Oceanography Command [Ref. 10: p. 3]. These tasks require a great deal of collection, manipulation, and analysis of data. In order to support

the various needs of FNOC concerning oceanographic and meteorological data, a Computer Systems Department exists within FNOC. The basic function of the Computer Systems Department is the efficient and timely operations of the computer center. This also involves the effective utilization of the Command's ADPE. The Computer Systems Department provides support services to other departments within FNOC including equipment configuration planning, software development support, hardware system development support, facilities planning, and systems analysis/consultation [Ref. 10: p. 30].

Planning for its computer facility has prompted the Computer Systems Department at FNOC to develop a Long-Range EDP Plan. This plan or report enables the department to maintain an overall perspective regarding future demands and necessary departmental growth to meet future commitments.

All information in this section is drawn from the FNOC Organization Manual and Long-Range EDP Plan. The EDP plan was devised by FNOC's Computer Systems Department. In developing their Long-Range EDP Plan, FNOC computer systems personnel used a plan written by William B. Miller for the July 1979 Journal of Systems Management entitled, "Developing a Long Range EDP Plan," as a primary reference.

2. FNOC's Long-Range EDP Plan

FNOC's Long-Range EDP Plan summarizes some of the principles for developing a long-range EDP plan. These principles can be applicable to almost any EDP department, regardless of size or function. The FNOC Long-Range EDP Plan includes a plan time frame, a plan foundation, plan content, and an approach to the development of a plan.

a. Time Frame of the Plan

The long-range plan should not be constrained by current problems. It must be consistent with short-range plans, but it should be more than just an extension of them. The time frame of the plan runs from three to five years. This 3-5 year planning cycle corresponds very closely to the programming concept discussed in Chapter III.

b. Foundation of the Plan

Any plan requires solid foundation. Part of the foundation is the role of the systems or EDP department. Decisions should be made regarding the scope of the systems department responsibilities and the business orientation of the department. Scope concerns whether the systems department is responsible only for in-house systems development and maintenance or if its responsibilities include coordination of outside services. At FNOC these outside services include the preparation of procedures manuals, all EDP training of FNOC personnel, and other system-related details. The business orientation of the department concerns the classification of systems personnel as technicians, analysts, or general problem solvers [Ref. 23: p. 2]. Whatever is required to clarify the systems department's role within the organization should be done Without a firm definition of EDP responsibilities, the plan will most probably never get off the ground

The remainder of the plan's foundation includes the key decisions about the future direction of the Computer Systems Department regarding EDP. The decisions involve two aspects of the future: Application systems and EDP approach. The term "application system" is

used broadly at FNOC to mean a process for performing a function, exclusive of EDP functions that support the application systems. The overall EDP approach should describe the framework in which the applications systems will be developed and supported. The systems department should participate in the decision making process, but top management within FNOC should bear the final responsibility because of the importance of the decisions.

Application systems are the driving force behind the EDP plan. Application systems development and maintenance are the primary source of requirements for hardware, software, personnel, and facilities.

The application systems must support FNOC's objectives and the strategies and tactics for attaining the objectives. The individuals in management who develop the objectives, strategies, and tactics are the key decision makers concerning application systems. They are assisted by the Computer Systems Department in a manner consistent with the Computer Systems Department's defined responsibilities, such as provision of systems analysis and technical guidance [Ref. 23: p. 4].

A description of the overall EDP approach is also part of the EDP plan's foundation. The Computer Systems Department plays an important part in establishing this approach under the direction of top management. The Computer Systems Department should document the resolution of key EDP issues. The key issues include such things as EDP centralization versus decentralization, EDP as a cost center versus

a profit center, and the organizational placement of the EDP function. The important point is that issues should be identified and resolved.

c. Contents of the Plan

Any EDP plan should be formally documented with appropriate summaries and supporting detail. The format of the documents should satisfy the communication requirements of the organization.

Any EDP should include the following information.

(1) EDP Approach and the Computer Systems Department's Role. These key decisions concerning approaches and roles of the computer systems department should be properly documented.

(2) Current EDP Situation. Current systems and level of resources presently utilized is necessary in order for decision makers to draw a comparison between the current situation and the proposed EDP plan to make an assessment of the risks involved with such a venture.

(3) Long-Range Goal and Intermediate Stages. User departments must make the key decisions regarding future application systems, with assistance from the Computer Systems Department. The Computer Systems Department has the primary responsibility for determining the technical implications of the decisions. The Computer Systems Department should also identify the EDP administrative systems that are required to support application systems development and other EDP activities. The stages and long-range goals for individual systems should be integrated into one set of intermediate stages and long-range goal.

(4) Specific Development and Maintenance Projects. Specific development and maintenance projects for the first intermediate stages (usually six to nine months) should be described. By budgeting and scheduling specific projects, the tendency to be overly optimistic in estimating how rapidly the intermediate stages and long-range goals can be achieved is counterbalanced. Milestones (checkpoints) should be included in the project schedules. The milestones serve a dual purpose: For measuring progress on the project and also on the long-range plan, since the projects represent the first step of the plan. A manager should be able to measure his performance and results against the goal.

(5) Plans to Satisfy Support Requirements. Support requirements should be identified for each stage, including organization, staffing, facilities, equipment, and software. A description of the plan should include activities, responsibilities and schedules for satisfying existing requirements.

(6) Control Procedures. Control procedures help to assure that the plan, if approved, will be implemented successfully. They are useful in that reviewing control procedures frequently identifies deficiencies, and management approval of the EDP plan is easier to obtain if control procedures are included.

Control procedures can include the following:

- Systems development and maintenance methodology/procedures
- Project control procedures related to achievement of project schedule and cost objectives
- Nonprofit-related, cost control procedures (e.g., comparison of departmental costs to standards or averages)

- Equipment utilization measurement and analysis procedures
- Data processing operations controls
- Administrative and facility controls, such as insurance, security, disaster prevention, and recovery plans

Specific control procedures can be tailored to the elements of the overall EDP plan [Ref 23: pp. 5-6].

d. Approach to Development of the Plan

There are basically four groups that may be involved in the preparation and approval of a long-range EDP plan: (1) The Computer Systems Department; (2) user departments, (3) an upper-level management group consisting mostly of department heads; and (4) top management consisting of the commanding officer, executive officer, and budget director.

The upper-level management group may be formalized as an EDP steering committee, or it may remain informal. The function of top management is to review the long-range EDP plan in the same way it would review any other large, important expenditure and commitment of resources.

There are many ways in which the four groups can interact to develop an EDP plan. An example approach is provided to offer credence to this methodology.

The steering committee and top management define the role of the Computer Systems Department and the basic EDP approach of the organization. The Computer Systems Department then provides current status information. User departments and the steering committee, working with the Computer Systems Department, identify and prioritize

future systems development and maintenance requirements. The Computer Systems Department coordinates development of documentation describing long-range goals and intermediate stages. Alternatives are also identified. The steering committee reviews alternatives for long-range goals and stages and selects one of the alternatives for in-depth planning. Implementation details for the selected long-range goal and intermediate stages are developed by the Computer Systems Department, with user input as required. Details include specific systems projects and planning for equipment, facilities, organizations, and staffing. The Computer Systems Department adds control procedures to the plan. The steering committee reviews the total plan and either approves or requests modifications to the plan. Upon approval by the steering committee, top management reviews the plan and either approves it or returns it to one of the preceding steps for modification.

Numerous other approaches are possible and can be used depending upon the organization and the environment in which it operates. Successful approaches will have some things in commmon such as the concepts of users and the computer systems people working together, and the approval and commitment of top management to the final version of the plan.

The Computer Systems Department at FNOC uses this plan to assess their present capability, recognize their future commitments, and acquire the necessary resources to satisfy future departmental requirements.

E. SUMMARY

The managerial and control techniques elaborated upon in this chapter are only an example of the numerous techniques available to managers. The primary aim of the chapter was to describe those techniques discovered during the research conducted for this project that might be adapted to or utilized by the Data Processing Department at NFC. It was not the intention for this chapter to offer a survey of possible solutions to managerial problems but rather to present specific/effective techniques practiced at the facilities mentioned. The utilization or application of these techniques at NFC is the subject of Chapter V.

V. MANAGEMENT CONTROL FOR NFC'S DATA PROCESSING DEPARTMENT

A. INTRODUCTION

As mentioned in a previous chapter, NFC is undergoing a reorganization which involves the reorganization of the Systems Department into an Information Systems Directorate with two major departments: Systems Development and Data Processing. Management control of the Data Processing Department is the focus of this study. In this chapter, we look at where the department is heading (for example. organization. tasks, and projects). Attention is directed toward data center and control considering the techniques of FACSO and FNOC alluded to in Chapter IV and their applicability for the Data Processing Department at NFC. Also, HP managerial techniques (MBO, SDM) and possible NFC applications are discussed while emphasizing the need for effective management control in the data processing environment.

B. WHERE IS THE DATA PROCESSING DEPARTMENT HEADING?

The Data Processing Department at NFC is presently undergoing a reorganization project that will effectively establish the department as a data center. The arrangement will be very similar to the Navy Regional Data Automation Centers (NARDACS). The Personnel and Pay Systems Consolidated Computer Center (PERSPAY) Program, of which this reorganization is a portion, is an effort begun in 1978 to accomplish the consolidation of the data processing operations of the Naval

Military Personnel Command (NMPC) in Washington, D.C. and NFC in Cleveland. This Consolidated Data Processing Center, located at the Bratenahl Computer Center Annex outside Cleveland, will be operated by personnel currently staffing the Data Processing Department at NFC. The Data Processing Department will move from downtown Cleveland to Bratenahl, acquire software and hardware to support the PERSPAY data center, organize the Bratenhal facility for data center operations, and ensure the necessary resources (equipment and personnel) are available in order to begin functioning as a fully operational service-oriented data center by Spring 1983.

The majority of the tasks and projects required to bring about this transition have already been accomplished or are near completion. The details regarding software and hardware acquisition, personnel changes, and other requirements associated with this transition are not addressed because these decisions have been made and are beyond the scope of this study. What will be addressed is planning and control for a data center, which NFC's Data Processing Department will become. In this section, some of the management control techniques mentioned in Chapter IV, especially the programming or the 3-5 year planning cycle are focused upon. The reason for the emphasis on the 3-5 year planning cycle should be explained. This planning cycle serves as a vital link for planning purposes between strategic planning (where overall organization goals are established) and management control. During a visit to NFC to discuss the future movement of the Data Processing Department, planning stood out as that managerial technique most important for ensuring that the transition from data processing

department to data center is carried out most effectively. The next section focuses on the importance of planning and control and discusses the relationship of FACSO's Five-Year ADPE Plan with FNOC's Long-Range EDP Plan mentioned in Chapter IV.

C. PLANNING AND CONTROL IN THE DATA CENTER

Information in this planning and control section was ascertained through a visit to NFC and from a portfolio written by Phillip C. Cross, Director of the National Data Center for Federated Department Stores [Ref. 5]. This section offers relevant information to prepare for the evolution of NFC's DP Department to a data center.

1. Problems Addressed

Planning and control are necessary activities in any data center, whether it is a large multicomputer installation or a remote entry and distribution facility. Yet, in many data centers, planning and control can be inadequately administered. Too often data centers are run "by the seat of the pants."

Developing such a planning and control function is not easy but the results can be well worth the effort. The development process can best be understood if viewed from two levels. The first is the management level, where a framework is established in which planning and control can be carried out efficiently. The second is the operational level, where planning and control are applied where most effective. Top management of the Data Processing Department at NFC does support planning and control. A two-year plan for the Data Processing Department is employed to delineate goals and objectives for

that period. What remains is to impress the importance of planning and control on middle management and convince them of the ongoing nature of such a technique.

When planning and control are successfully established at both levels, it seems reasonable to expect that the frequency of crises will become rare and that a feeling of professional competence will grow in the data center. In such an environemnt, there are few unpleasant surprises; managers and subordinates alike can relate their performance to current and future needs and act on improving that performance.

2. Planning

Planning is a complex management process whose thrust is to maximize the data center's contribution to the organization. NFC's managers might find it beneficial to organize planning according to the following objectives:

(1) To view the data center within the context of the entire organization

(2) To use all resources effectively

(3) To provide high service levels while keeping costs as low as possible

(4) To minimize false starts

(5) To outline a strategy that can enable the data center to take the greatest advantage of forecasted developments

(6) To specify checkpoints that can be used to measure progress [Ref. 5: pp. 2-3].

a. Viewing the Data Center in Context

Data center managers often become so engrossed in day-to-day operations that they lose sight of the center's long-term responsibilities to the organization [Ref. 5: p. 3]. This mode of

operation can lead to a self-centered attitude in the data center, a tendency to add personnel and facilities for "fighting fires" and expediting reports, and to exhibit a "take it or leave it" attitude toward users. This sort of mode of operations would be a reflection of the data center management's loss of objectivity and sense of purpose. Under this sort of situation, management may gradually succumb to events and circumstances and lose sight of the organization's goals and objectives.

How does one keep the proper perspective of the data center? One suggestion is to define the data center's goals in terms of the goals of the organization and to prepare and maintain a plan to achieve those goals. This requires well-defined organizational goals and top-managemnt support. Without these, data center managers may tend to lack direction.

b. Using Resources Effectively

Because of continuing growth in data processing technology and its increasingly diversified applications, data processing costs will most likely continue to rise despite improved cost performance [Ref. 5: p. 4]. To cope with this constant program growth, management must maximize the effectiveness of both facilities and personnel. Such a large capital investment in hardware, software, and telecommunications should be based on as accurately forecasted requirements as possible. Similarly, personnel planning should be employed to determine when and how much personnel effort and expertise are needed. Effective personnel planning is often much more difficult than facilities planning. This sort of planning requires an

understanding of personnel skills and job requirements. In addition, NFC management should be concerned that sufficient training is envisioned to provide the required technical expertise to operate the data center. NFC can follow FNOC's training plan mentioned in Chapter IV to ensure their personnel remain technically competent.

c. High Service Levels and Low Cost

One of the data center management's primary objectives as well as their greatest challenge is to maximize service levels while minimizing costs. A common problem when management attempts to improve service levels is that this objective usually consumes additional resources. Unless the data center is operating inefficiently, attaining higher service levels almost always means increasing operating costs.

Optimizing this cost-service trade-off is particularly difficult if costs are held to austere levels. In such cases, staff is pared to the bone, while computing and peripheral capacity is kept very close to full utilization. If faced with this dilemma, management must clearly look for latitude between the cost limitations that must be met and the service levels expected by users. With this knowledge, management can construct a realistic plan which identifies the current and future actions that must be taken to optimize the cost-service trade-off.

d. Minimizing False Starts

Because any plan is based partly on forecasts of uncertain future events, deviations from the plan are unavoidable; however, effective planning can greatly reduce false starts (i.e., ill-directed

expenditures and effort). The intelligent manager can use planning as an "insurance policy" by involving both superiors and subordinates in the planning process and by having them approve the plan and their respective roles in its implementation. With this kind of support, the plan becomes "our plan" instead of the data center manager's plan. Such planning has a strong foundation of technical and managerial knowledge that addresses the widest range of circumstances and thus reduces false starts [Ref. 5: p. 5].

e. Outlining a Strategy

Forecasts of future developments in the data processing area involve predictions of substantial changes in technology, operations, or business requirements. The challenge in this environment is to develop a strategy that will enable a smooth transition from the present to the future, while optimizing the cost-service trade-off throughout the planned period. The impact on resources and productivity can be significant during such transitions.

f. Specifying Checkpoints

Checkpoints, or milestones, must be incorporated into the plan to enable management to track the data center's progress, checkpoints are the link between planning and control. To accommodate checkpoints, a plan should be segmented to facilitate optimal management, tracking, and adjustment. Checkpoints can be used to evaluate financial and technical aspects of data center performance. A financial checkpiont might track budgeted accounts or project benefits. A technical checkpoint might track production processing performance.

If checkpoints are effective, they will serve as warnings to data center management, signalling that corrective action is needed. Improper checkpoints may fail to detect negative trends or may even give management a distorted view of the actual situation.

An effective planning device which could be utilized by NFC data center managers is the Plan of Action and Milestones (POA&M) technique. This technique calls for the establishment of checkpoints for each job to be performed in order to achieve a specified objective. One aspect of POA&M is that each job becomes the responsibility of some division or work center with an accompanying completion date. The progress on these particular jobs is assessed periodically by top-level and middle management in order to determine whether the overall objectives will be satisfied. The POA&M technique has proven to be an effective means for utilizing checkpoints to define job responsibility, assess progress, and to realize organizational goals. This technique breaks the overall objective (for example, to pass a data center administrative inspection) into smaller, more manageable segments. Checkpoints in this system alert top management to areas where expectations may have exceeded actual performance.

3. Control

The previous discussion of planning mentioned the importance of measuring current performance against the plan as well as the need to anticipate where current trends are leading. Control techniques provide data center management with a measuring capability to assist in these tasks. Measurement, however, is only one aspect of control. Control also includes the ability to guide performance to meet

expectations and to adjust performance if it deviates from expectations. These three aspects could serve as the basis for a control effort [Ref. 5: p. 6].

a. Measuring Performance

Meaningful performance measurement requires a unit on which measurement can be based, a means of making the measurement, and assurance that the measurements are valid.

There are usually only three units appropriate for measuring a particular event or activity: Dollars, time, and quantity. A list of events to be measured could cover all data center activities, with each event measured in terms of at least one of these three units [Ref. 5: p. 7].

Quality is sometimes considered a unit of measurement. Although this perception has some validity, quality is usually more difficult to capture [Ref. 5: p. 7]. Quality is non-quantifiable in most instances and for this reason is often dismissed as an ineffective measurement unit. Although quality may be hard to capture, it can often serve as a valid measure.

The means for making measurements should also be considered. Frequently, too much emphasis is placed on automated measurement when manual means would suffice [Ref. 5: p. 7]. In many cases, manual logging and recordkeeping are the best and cheapest methods of obtaining needed data. For some activities or events, however, automated methods are the only practical or possible way to collect data.

The accuracy of measurement should be taken into consideration by the manager. Measurements which prove to be unreliable or inaccurate should not be utilized in the decision-making process. Such misplaced reliance is common in many data centers, particularly when measuring such complex performance characteristics as CPU and controller. Mis-measurement in such complex areas can usually be traced to inadequate understanding of the measurement tools or of the activity being measured. Poor measurement can conceal the need for corrective action.

b. Guiding Performance

Data center performance policies and standards are very important for proper control. Policies are on a higher managerial plane than standards, they define general goals, intentions, strategies, or attitudes concerning the data center. Standards are derived from policies and establish specific performance criteria that should be met to satisfy the policies. Communication between the various levels of management is very important when establishing policies and standards. Senior management should recognize what standards are needed at the operating level to satisfy a particular policy.

Since the basic objective of a service-oriented data center is to keep operating costs as low as possible while providing the highest possible level of service, performance levels should be instituted which can aid in meeting one or both aspects of this objective. With this goal in mind, management should assign priorities to determine what kinds of standards would be most effective. On-line

data storage management, project management, data security, job scheduling, problem control, operating documentation, equipment utilization and methods of equipment acquisition and justification are examples of areas where standards may be established to guide performance within a data center.

Standards should be specific; they cannot contain ambiguity that might allow misinterpretation or purposeful distortion. It is often difficult to determine when these standards of performance are specific enough. One method is open communication between management and employees. Without this necessary feedback, management will not recognize when employees have failed to grasp or fully understand performance standards. When employee performance closely satisfies established standards, management should regard these standards as clear and understandable. The objective of standards is to ensure correct performance, which might not occur if activities are unguided. To prevent such problems, standards should be made as specific as possible in terms of dollars, time, quantity, and some concrete qualitative measure such as customer satisfaction. Each performance measure should contain at least two of these four basic measures.

One of the most effective measures of integrating standards is to ensure acceptance by the employees involved. This can be achieved most readily by communication (between managers and employees) and education. If the performance standards are viewed as beneficial, they will be readily included in the daily activities of the data center. If standards are fully accepted, performance measurements can be made without reservation. the personnel being evaluated can

understand their meaning and purpose, and performance can be readily adjusted when necessary.

c. Adjusting Performance

Knowing where actual performance stands in relation to desired standards is only half the battle; the other half is modifying performance to bring it within desirable limits. To facilitate performance adjustments, performance measurements should be:

(1) Pertinent and sensitive to supervisory or technical actions, so that when such actions are taken, their consequences can be readily observed in the measurements

(2) Accurate, unbiased, undistorted

(3) Within the staff's interpretive capability

Measurements that meet these criteria will help management in their efforts to keep data center performance close to planned levels. Management at NFC will recognize that the performance measures are effective through manager/employee communication and the ease with which unsatisfactory performances are adjusted.

4. Where to Apply Planning and Control

Planning and control offer many positive advantages to data center management; however these processes should only be employed where they are most beneficial to data center management. Two of the more prevalent planning and control processes are budgeting and resource utilization. These two areas are considered important for successful data center performance and could prove beneficial for the NFC data center.

a. Budgeting

NFC data center management must plan and control their expenses. How they accomplish this is up to them. Some data centers prepare budgets down to the lowest possible expense level. Others simply lump expenses into general categories. Some budgets are projected for only a few months while others are extended to two years. The important point is that user requirements must be estimated, either by the users themselves or by data center management. The appropriate level for specifying expenses varies for each activity.

For budget control, some data centers require a detailed monthly explanation of variances by account, explaining why actual expenses were greater or less than the budgeted amounts. Other data centers may merely note variations for use in forecasting the next budget.

Some managers believe budgeting is the only necessary form of planning and control. This is satisfactory if the manager is only concerned with costs. He should also be concerned with the value received for dollars expended. To monitor value, planning and control should also be applied to resource utilization.

b. Resource Utilization

Even if data center costs are kept within budget, this does not guarantee that resources are being used efficiently or effectively. For example, there might be enough unused CPU capacity to make a CPU downgrade possible without adversely affecting service. Alternatively, it might be feasible to reassign personnel and reduce the staff without

any adverse effect. Excesses often occur in a data center that has experienced a plateau after a spurt of growth.

Unfortunately, use of data center resources (both people and facilities) is often measured in terms of effort or activity, not in terms of effectiveness or productivity. This is the difference between quantity and quality measurement mentioned earlier in this chapter. Long, hard hours put in by data center personnel as well as CPU and peripheral saturation do not always mean that data center resources are being used productively. To ensure that utilization is effective, it should be planned and controlled in terms of the value or benefits derived.

5. Planning and Control Checklist

A comprehensive planning and control framework can be instrumental in helping management achieve the performance objectives of the data center. Planning and control checklists are sometimes developed to facilitate the manager in his efforts to establish an effective data center. Such a checklist developed by Mr. Phillip C. Cross is offered as an example [Ref. 5: p. 14]. This example could provide NFC management with possible planning and control techniques that may help to establish an effective data center:

(1) Are data center plans keyed to the objectives and goals of the organization?

(2) Do all levels of management participate in data center planning and provide their support and participation where necessary to accomplish these plans?

(3) Does the data center plan maximize the use of all data center facility and personnel resources?

(4) Is every effort made to optimize the cost-service trade-off in the plan?

(5) Does the plan provide a strategy for smooth evaluation from present to future conditions when the future conditions differ significantly?

(6) Does the plan include checkpoints to compare actual progress against the plan and to forewarn of potentially dangerous problems?

(7) Are the controls based on accurate and meaningful performance measurements?

(8) Do the control techniques provide the capability to guide and adjust performance as well as to measure it?

(9) Do performance standards explicitly define levels of cost, time quantity, and (if possible) quality?

(10) Have performance standards been prescribed for those areas of data center operation where they are most needed?

(11) Are performance measurements made in the most economical manner possible?

(12) Are performance standards keyed to operating policies?

(13) Is a periodic audit performed to ensure that the data center is not over- or under-controlled?

(14) Do all data center personnel thoroughly understand their individual responsibilities for planning and control?

(15) Are both resource utilization and financial expenses planned and controlled as effectively as possible?

(16) Do plans and controls consider activities performed outside the administrative authority of the data center that affect data center performance?

(17) Is planning and control practiced as a vital and continual activity throughout the data center?

D. HEWLETT-PACKARD MANAGERIAL TECHNIQUES

In this section, a short review of two Hewlett-Packard managerial techniques discussed in Chapter IV is presented. Those techniques are

Management by Objectives (MBO) and Segmented Documentation Methodology (SDM). Applicability of these two techniques for the management of NFC's Data Processing Department and future data center is discussed.

1. Management by Objectives

At Hewlett-Packard, MBO means all the efforts of the organization being directed toward the accomplishment of well-defined objectives. The achievements of the company are the results of the combined efforts of each individual working toward these common objectives. Hewlett-Packard top-level management established seven corporate objectives; and the objectives of each department, division, and individual are derived from these seven objectives.

MBO could be used in a similar fashion by the Data Processing Department at NFC. Top-level management has established command objectives. It is important that they are understood by all Data Processing Department personnel. It is then the responsibility of the various divisions to establish their own set of objectives that will enable them to achieve command objectives. This allows the divisions the freedom to work toward these goals and objectives in ways they consider most sensible. The Data Processing Department is already practicing MBO as evidenced by the eight departmental objectives outlined in Chapter II. What Data Processing Department management should investigate is whether these objectives coincide with or lead to the accomplishment of command objectives. Data Processing Department management should also assess the objectives of their operational divisions to ensure everyone is pushing in the same direction.

As mentioned in Chapter IV, MBO should not mean anarchy. It is a means for establishing organizational objectives and utilizing these objectives to achieve desired goals. MBO can be a feasible management technique for the Data Processing Department at NFC provided a common set of command objectives is established, implemented, and adhered to at all levels of management.

2. Segmented Documentation Methodology

SDM is a management tool used by Hewlett-Packard to aid in the development of or a modification to any operational system. It involves the preparation and constant review of documentation that accompanies this development from conception to completion. An SDM development process includes the initial study, design, implementation, evaluation, operation and maintainence of the system. The various characteristics of SDM are elaborated upon in Chapter IV. For the Data Processing Department at NFC, this management tool could be utilized to solicit suggestions from users regarding feasible system innovations and improvements. The important word when considering SDM is "system". It is a system that will either be created or amended. SDM accomplishes this in a systematic manner by investigating characteristics such as the costs, resources required, and benefits of each significant undertaking. A system is not merely developed for the sake of new developments. An in-depth analysis is performed to exhibit its feasibility and profitability. NFC could possibly benefit from such an approach when pondering the development or improvement of any data processing system. Appendix I (SDM Case Study) can be consulted for further amplification.

E. SUMMARY

Planning and control for a data center served as the focus of this chapter. NFC's planning and control should be considered closely by NFC management prior to and following the establishment of the data center. These planning and control methods mentioned, along with MBO and SDM, are applicable for the management of NFC's data center. These methods can aid NFC in the establishment of an efficient and effective data center. They are by no means the only methods available, but have been proven successful in similar environments.

VI. CONCLUSION

The primary purpose of this study was to emphasize the importance of an effective management control system for the Data Processing Department at NFC. As discussed in Chapter III, management control is a broad concept involving numerous managerial techniques and methods.

The initial portion of the study (Chapters I-III) was presented to familiarize the reader with NFC's organizational structure and to offer a normative description of management control systems. Chapters IV and V discussed management techniques and controls utilized by existing organizations and their applicability to the NFC data center. Emphasis was placed on the management of data processing within these organizations in an effort to tailor these managerial techniques to the needs of NFC's data center.

In this chapter, some interesting implications for designing planning and control systems offered by Robert N. Anthony will be presented along with recommended managerial techniques for NFC. Also, several additional areas of research are mentioned for future thesis study.

A. SOME IMPLICATIONS FOR SYSTEMS DESIGN

As NFC moves to establish a data center, it is important that management recognizes some of the key, associated problems that accompany the design of any planning and control system.

Some implications can be drawn about the overall problem of designing planning and control systems; and these are presented most clearly by Anthony in his work, Planning and Control Systems: A Framework for Analysis (1965).

> First, it seems clear that the starting point in construction of the overall system should be management control, as distinguished from strategic planning, operational control, information handling, or financial accounting. The management control system deals with the ongoing operation of the whole organization. It must encompass all parts of the organization so as to assist management in determining that the parts are in balance with one another. The central function of a management control system is motivation; the system should be designed in such a way that it assists and guides operating management to make decisions and to act in ways that are consistent with the overall objectives of the organization.
>
> Strategic planning, management control, and operational control tend to correspond to a hierarchy in any of several dimensions: as to the time span of consequences (long-range, medium-range, and day-to-day); as to level in the organization (top management, top and operating management, supervision); as to importance of a single action (major importance, medium importance, little importance); as to the amount of judgment involved (great, some, none), and so on. Along each of these continuums, management control is in the middle.
>
> Second, although the management control system is the logical starting point, its relationship to the other systems should be recognized. Information useful in strategic planning can be derived from the management control system, and strategic decisions are implemented through it. Recognizing these facts is quite different from designing the management control system as though it included strategic planning, however. The criteria governing the two systems are quite different. Management control is repetitive, it is total, it is systematic, it is internally oriented, it is people oriented, it is a line function. Strategic planning focuses on specific problems, it is externally oriented, it is irregular, it is heavily staff oriented, it is logical. The management control system can be designed so as to take into account the more important needs of the strategic planners for current and historical operating information, but it cannot possibly foresee all these needs, nor would it be worthwhile to supply routinely information that is needed only occasionally, even if the need could be foreseen.
>
> Management control also takes information from areas where operational control devices are used, but the coupling between the two need not necessarily be tight. Operational control usually involves a tremendous amount of detail, and all that is needed for

management control purposes is a way of summarizing and translating this detail so as to show that operations are proceeding satisfactorily, or, if they are not, where the trouble spots are.

Information handling is subservient to management control. The needs of the latter dictate the construction of the former, and not vice versa. [Ref. 1: pp. 113-114]

Management control is the key ingredient for the successful operation of NFC's data center. Top management must comprehend management control's importance and implement those techniques necessary to establish an effective system.

B. RECOMMENDED TECHNIQUES

The following managerial and control techniques discussed in Chapters IV and V are recommended for implementation by NFC's Data Processing Department. These techniques are regarded as effective planning and control devices and could be used to assist the Data Processing Department managers.

Management by Objectives and Segmented Documentation Methodology, two managerial techniques practiced at Hewlett-Packard, are considered applicable and feasible methods of management for use by NFC managers.

MBO is already practiced to some degree by NFC's Data Processing Department. It is important for NFC's top-level management to establish organizational objectives that are understood by and applicable for all NFC personnel. With all personnel working toward the same goals and objectives, chances of achieving these specific milestones are greatly enhanced. MBO is not anarchy, and NFC must establish the necessary structure to ensure that this technique can reap the benefits for NFC that it has for Hewlett-Packard. It is

recommended that the possibility of instituting an MBO policy at NFC be fully investigated. It could pay large dividends for the organization and its personnel.

Although SDM is a management technique unique to Hewlett-Packard, it is applicable for NFC. It can be viewed as an expansion of a cost-benefit analysis for system design and improvement. It compels the designer (any member of the organization) to fully investigate a project. Contained within an SDM is an analysis of the costs, benefits, requirements, and organizational impacts associated with the project. SDM offers the manager a systematic approach for the development of a proposed system. SDM gives the manager the information needed in order to extensively assess the project and make an intelligent decision regarding its feasibility. Such supportive data and in-depth analysis is needed at NFC for such things as system design enhancements and equipment procurement justifications. Following the systematic approach and analysis suggested in Appendix I (SDM Case Study), SDM could be beneficial for NFC Data Processing Department managers as they contemplate their next computer system design enhancement or hardware procurement.

Planning was emphasized throughout the study and its importance should not be neglected by NFC management. The 3-5 year planning cycle or program planning techniques were discussed in Chapters IV and V. Both FACSO's Five-Year ADPE Plan and FNOC's Long-Range EDP Plan should serve as good models for NFC in developing program planning techniques and strategies. Programming serves as a critical link between strategic planning and management control.

One important thing to also consider in program planning is the environment in which the planning takes place. NFC's Data Processing Department must consider closely the environment within which they are operating. The environment in which program planning takes place has a strong bearing on the eventual success of the plan. The data processing function does not exist in an organizational vacuum. As part of the organizational environment, its planning must be consistent with the plans of all other elements of the organization. In addition, no plan for one part of the organization can be designed independently of the overall organization plan. A successful 3-5 year plan for data processing cannot be developed unless there is a specific 3-5 year organizational plan with stated goals and objectives for the oganization and for all user departments. Such a hierarchy of goals and objectives should be established by NFC. After this establishment, it is the responsibility of department managers to establish their own objectives and ensure data processing personnel understand them and the relationship of these objectives to organizational goals.

The planning and control checklist presented in Chapter V is considered to be a useful method for assessing the effectiveness of a data center's management control system. A comprehensive planning and control framework is crucial for meeting the performance objectives of a data center. Even data processing managers with an established planning and control program should periodically analyze the program to ensure that the planning and control efforts are effective. The checklist presented in Chapter V can be adapted to the data center at NFC. It is a feasible and recommended technique for NFC. Affirmative

answers to the questions on the checklist indicate a sound planning and control program.

C. ADDITIONAL RESEARCH AREAS

During the research for this study, many interesting subjects involving data processing management were uncovered that could warrant further research and could serve as feasible thesis topics for future students. Several possible topic areas are suggested for further investigation:

(1) Investigation of forecasting models for predicting data processing growth

(2) Developing budgetary methods for the justification for future data center procurements

(3) How can a user support group help in defining user needs

(4) Computer capacity planning methods for Cleveland's data center.

The management control techniques discussed in this study have proven to support the overall effectiveness of the organizations considered. They are considered applicable for NFC's Data Processing Department and future data center. Despite the fact that an assessment of their usefulness is somewhat subjective, they are techniques that have validity. It therefore behooves the prudent manager to take them into account when considering management control due to the success they have inspired in actual organizations. The manager who considers an organization to be unmanageable, due to its size or diversification, and who chooses to ignore established methods of management is fighting a losing battle.

APPENDIX A

SDM Case Study

HEWLETT PACKARD | SEGMENTED DOCUMENTATION | DATE 11/20/80

GENERAL DOCUMENTATION FORM | PAGE Page 1

DOCUMENT NAME	System Requirements Def.	APPLICATION NAME	Order Management Sys.
PART	Title Page	SECTION	

MARKETING ADMINISTRATIVE SYSTEMS

ORDER MANAGEMENT PROJECT

SYSTEM REQUIREMENTS DEFINITION

Prepared by
Sherry Harvey
Computer Support Division
(408) 996-9800 Ext.231

1

INTRODUCTION

The subject of this study is a proposed automated order management system. To adequately address all order management problems will require developing a system to perform vast numbers of complex functions using a large number of files.

The Marketing Administration Systems (MAS) strategy is to modularize the order management system into logical phases of development beginning with the most critical functions for which data and files are currently available.

This document describes Phase I of the system and is concerned primarily with order entry and order status. Later phases will include such functions as automating purchase agreement discount retrieval and automatic credit approval.

TABLE OF CONTENTS

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The users of the Order Management System are:

Order processing coordinators
Order processing management
Credit and collections
Accounts receivable
Support management
Admin management
Sales management
Sales reps
Customers

PREPARING THE ORDER

When a customer purchase order (PO) is received, it is checked by the sales rep and/or sales secretary, then by order processing (OP). Phone-in orders go directly to OP. The information is next transcribed onto an order entry worksheet and supplemented with data required by the central processing systems and supplying divisions, for example:

Customer number and check digit	- from local kardex or Sales Office Data Access (SODA) system which runs on the 2026 COMSYS
Product info and check digit	- from the product and parts microfiche or SODA
Special instructions	- based on coordinated delivery or other policies requiring special coding
Sales commission, quota, tax, special handling, shipping, and required date	- from sales rep or customer and availability schedule
Purchase agreement or government contract information	- from the customer and local or regional files

Once the order coding sheet is complete, it is subtotaled and compared with the PO. If the dollars agree, the order is ready for entry.

PROCESSING THE ORDER

ORDER ENTRY:

Before the order is entered, it is logged, either manually or using SODA, and the next sequential order number is assigned to it. Customer credit is also checked.

The order is keyed into the Heart I screen in the US, SCOTCH in Europe or ORDENT in ICON countries. Edits and/or file lookups are performed. Transactions are formatted into CUMSYS messages which are routed to the central processing systems.

CENTRAL ORDER PROCESSING:

The central systems validate the order items and codes by processing them against the customer file, the product or parts file, and through extensive table edits.

Those orders that were correct (encountered no fatal edits) are placed on the open order file. Formatted order messages are routed to the factories involved and hardcopy validations are transmitted back to the sales office. In the case of SODA a subset of the order data is transmitted back to the local SODA order status file.

ORDER STATUS

When the factories receive the orders, they schedule the items and enter an acknowledgment message back into COMSYS. When all factories on the order have replied, or after five workdays have elapsed, the central system generates a hardcopy acknowledgment to the customer and to the sales office in the U.S. Internationally, messages are sent to the sales offices who in turn generate acknowledgments locally.

Some systems, such as SUDA and TRADEINV (Icon) receive and store acknowledgment and order update transactions on local data bases or files. These files can be accessed to respond to customer inquiries about the status of their orders. Offices without these systems use the weekly order status microfiche for information.

When orders change, if the factory changes its estimated ship date, a reacknowledgment is printed for that item only, and a message is routed to the sales office. The local automated systems are updated on a daily basis, whereas the microfiche will reflect the change the following week.

After all the items on the order have been shipped, it is deleted from central and local files after an appropriate waiting period (one week on Heart).

CHANGE ORDERS

When a change is requested by a customer or by the factory, order processing completes a coding sheet giving the items and sub items to be added or deleted or the order number to be cancelled. The data are entered into the order entry screen, and a COMSYS message is generated to the central processing system.

The central system edits the transaction, updates the open order file and forwards the change to the factories. A message is sent back to the sales office where a hardcopy validation of the change is printed and local files are updated.

The factory acknowledges the change (if pertinent to their products), and the central system routes the acknowledgment data back to the sales office so it can be sent on to the customer.

Reacknowledgments are generated in a similar fashion when the factory changes their estimated ship dates.

REPORTING

The entered orders provide the basis for worldwide statistics reporting systems. The individual sales offices receive daily error reports, transaction registers of messages sent, and daily dollar totals by product type. There are some additional reports produced by the local order entry systems.

AD-A128 199 ANALYSIS OF MANAGEMENT CONTROL TECHNIQUES FOR THE DATA PROCESSING DEPARTM..(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA J W MCGLOON MAR 83 2/2

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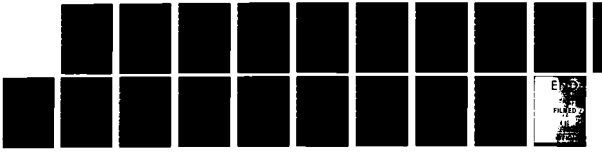
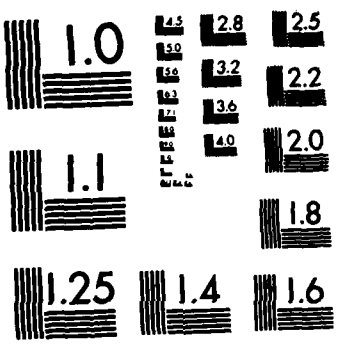
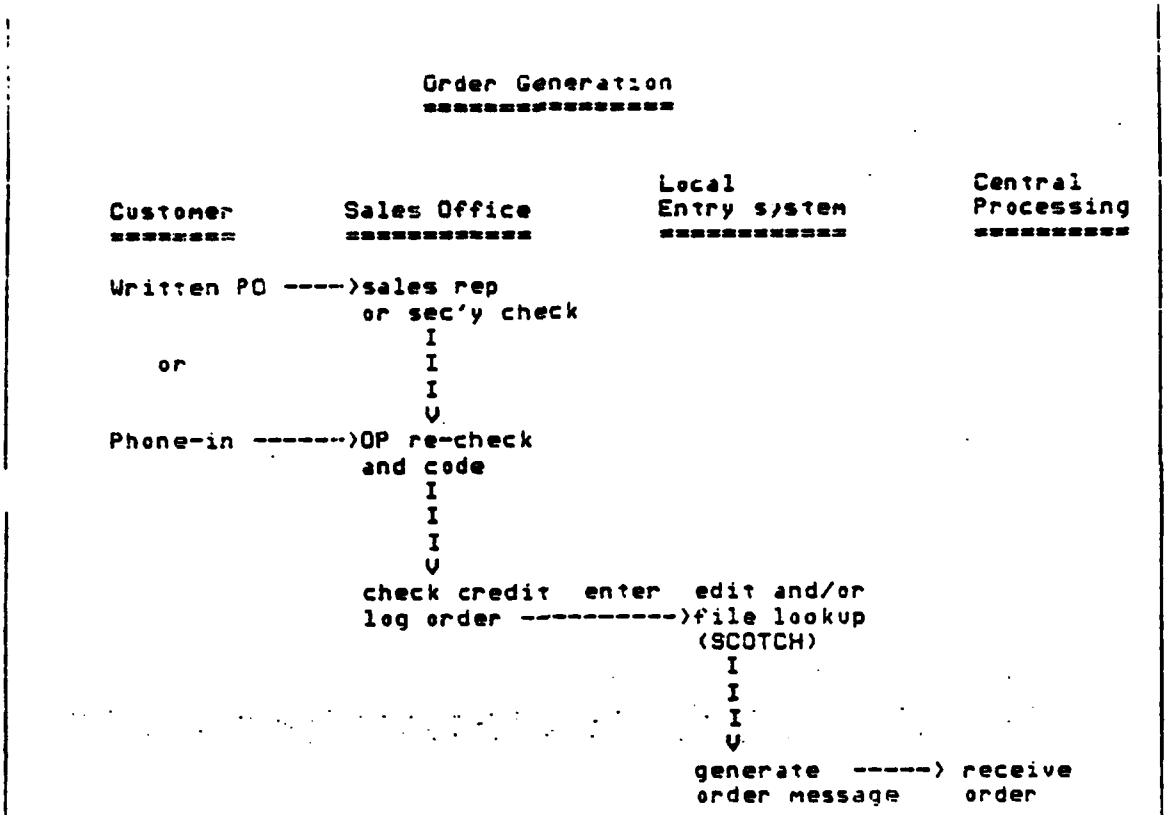





Order Generation
Customer
Sales Office
Local Entry system
Central Processing
Written PO ----->sales rep or sec'y check
or
Phone-in ------->OP re-check and code
check credit log order
enter
edit and/or file lookup (SCOTCH)
generate order message
receive order

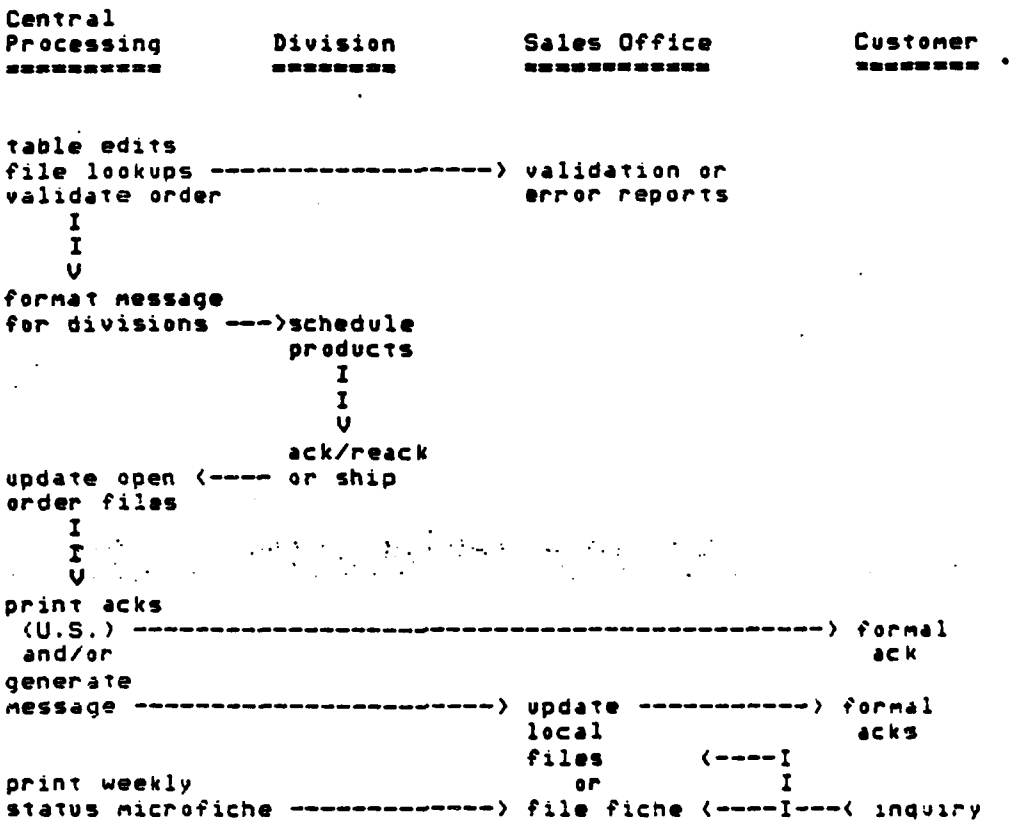
HEWLETT PACKARD | SEGMENTED DOCUMENTATION | DATE 11/20/80

GENERAL DOCUMENTATION FORM | PAGE Page 10

DOCUMENT NAME System Requirements Def. | APPLICATION NAME Order Management Sys.

PART Analysis of Present System | SECTION 2.2 Flow Schematic

ORDER PROCESSING



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OPERATING DATA

Estimated volumes of orders currently processed in a large district sales office are as follows:

New orders entered per day	= 100
Change orders entered per day	= 20
Daily data entry volume	= 120 orders
Order status inquiries per day	= 60
Order status updates per day (SODA)	= 2000
Hardcopy validations printed per day	= 100
Hardcopy ack./reacks received per day	= 150

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PROBLEM AND NEED ANALYSIS

1. Multiple Information Sources

Coding an order requires that you access, at a minimum, customer information, product/parts information and availability either manually, or using separate screens to get the information and check digits necessary to begin entering the order.

These data are then transcribed to coding sheets and re-typed into the order entry screens. Dollar totals are manually calculated. Each of these activities is a possible source of error and is time consuming.

2. Special Data Requirements

Data entry screens and local files do not contain fields for special data requirements such as: Earliest acceptable ship date (for Coordinated deliveries); support responsible office; local pricing, currency, language, and international shipment/billing data; the cross-reference trade order number (for leases and SI software support orders); etc. The data are needed to handle the complexities of systems and international business.

3. Incomplete Order Information

The complete order is not retained on a local data base or file after it has been validated. Looking up order status on microfiche or SODA often yields incomplete information, so you must refer to the hardcopy of the order which consists of a stack of sequential "one-liner" changes plus the original outdated order validation.

4. Change Order Processing

Often a simple change to certain order header fields requires cancellation and re-entry of the entire order. To delete an option, the line item and all associated options must first be deleted then re-entered with the change.

The order entry person, currently has to be concerned with much of the operational logic of order processing. This and the netting out of order changes should be made transparent to the user.

5. Unmanageable Acknowledgment Information

Customer acknowledgments and reacknowledgments are generated whenever any item or quantity of an item changes status date. The customer is inundated with individual sheets of paper listing single line item changes and reack dates.

There is no attempt to show a single, "Coordinated Delivery date" for coordinated delivery orders!

Sales reps have similar problems staying current on their customer's orders because they are dealing with the same unmanageable paperwork.

No acknowledgment information is sent to the "split" sales rep on the order. If, for example, an OEM orders from one sales office and the equipment is due to be shipped into another, the sales rep in the office the End User will be contacting knows nothing about the status of the order or shipments.

6. Reporting

Most types of printed status and statistical reporting generated by the current systems are incomplete, untimely, or difficult to obtain.

7. Inflexibility

The current systems lack the flexibility needed to easily "hook" into new sources of improved information and new systems currently under development such as the New Customer Data base, Purchase Agreement, Product File and A/R systems.

SPECIAL CONSIDERATIONS

This project is one of the tasks essential to the MAS strategy to convert from the existing sales office systems to distributed, HP3000-based sales administrative systems.

The primary constraint on the development of the project is the availability of the files and data on the HP3000 that are needed to perform the order management functions. If the product/parts data base and the new customer data base are not fully operational when needed, we will convert the existing SUDA files for use on an interim basis. This contingency will be discussed further in subsequent documentation.

PROPOSED OBJECTIVES

1. Insure the proper handling of acknowledgment information for Coordinated Delivery orders.

The first phase of the Order Management project will deal specifically with PT01 and PT02 coordinated delivery orders, but will not specifically exclude its use for other product types and orders. Our plan is to:

a) Reduce the flow of ack/reack paperwork to the customer and sales rep.

b) Generate complete, but succinct statements of status information and print ack/reacks only when the controlling item changes or products are added/deleted.

c) Provice arrival information, rather than printing individual ship date for each item.

d) Inform all sales reps involved on an order of its status in a timely fashion.

2. Simplify the task of order entry by providing all the order entry functions within the order entry screens. This would eliminate having to use multiple data sources or transcribing information prior to entry.

3. Make it easier to process change orders by storing the order for easy retrieval and by automatically performing the delete and add transactions necessary to make most of the processing transparent to the user.

4. Provide a flexible design to facilitate storing local order information and inputting special fields required by systems orders.

SYSTEM FUNCTIONS

1. Develop the capability to enter orders on the HP3000 by providing screens and functions which will:

   a) Retrieve customer number using customer name (or partial name) and address(s) and store it for the order entry screen.

   b) Retrieve product and option information using product # and retain the item in a list which will constitute the order body.

   c) Log the new order.

   d) Enter and partially edit new orders and change orders.

   e) Convert special fields on the screen such as service responsible office and "earliest acceptable ship date" to the proper format for Heart (or central system) processing.

   f) Accept and edit fields needed for local processing such as currency and billing codes.

   g) Incorperate intelligent default data automatically, wherever possible.

2. Build a local data base of inactive, active and billed orders for retrieval by customer name (or partial),by locally defined "handle", customer number, customer PO number or HP order number.

3. Format and transmit the appropriate Heart (or central system) transactions using the COMSYS network.

4. Accept status transactions from the central system and update the local order data base.

6. Provide the capability to recall orders to the screen, allow changes to the screen or product list and automatically generate the required add, delete, or cancel transactions to the central system for change orders.

7. Print complete data on customer acks or reacks and only when the controlling item on a Coordinated Delivery order changes. Estimate a delivery date and supress printing of individual line item status dates.

8. Print the local reports necessary to audit and maintain the integrity of the system and data base.

9. Provide the base system framework needed to easily add later phases and enhancements.

PERFORMANCE CONSTRAINTS

1. Update and Transaction Volumes

After initialization of the data bases, including the new customer and product file projects, the update volumes should be small. All updates will be done at night in batch mode.

For the on-line functions such as order entry and order status, the system should be able to manage more than quadruple the average load of activity during peak periods, because often over 50% of orders are entered during the last week of the month.

During the interim phase (if necessary) SODA files will be used to load the customer and product information. These update volumes will be substantial, but should not impose more than an additional hour's update burden on the system.

2. Response Time

Terminal response should not exceed 2 seconds on an unloaded system. The order management programs should be written such that they will not significantly degrade performance of other programs implemented on the same system.

3. Cycle Time

Order and update transactions should be processed within a one work day cycle.

DOCUMENT NAME	System Requirements Def.	APPLICATION NAME	Order Management Sys.
PART	Requirements Definition	SECTION	4.0 Data Base Constraints

DATA BASE CONSTRAINTS

1. Data Timeliness

All order status and customer data will be current as of yesterday. Product file data will be as current as each type of product information requires. However, during the interim phase it is likely that only weekly updates will be done on the produc file.

2. Data Completeness

At a minimum, the data base will contain full data for all fields used on the order.

3. Data Security

The standatd HP3000 account, group and user levels will be applied as well as Image security modes. Changes to validated orders will not be allowed on-line, but only throuch system-created transactions to and from the central systems.

INFORMATION REQUIREMENTS

Data needed for the operation of the Order Management System are as follows:

Customer Information

- customer name
- customer number
- customer address
- family number
- "handle" (if used)
- comments and credit information

Product Information

- product and option
- pricing data (including local currency needs)
- availability
- product line, sales force, product type
- suppliers
- short and long product descriptions
- OP notes and prerequisites

Order Information

- all entered data
- current status for each item
- factory shipment information
- shipment tracking data (intn'l)

Sales Office Information

- user identification codes
- sales office address
- office Comsys routing data

TANGIBLE BENEFITS

1. By decreasing the number of acks and reacks generated, we should reduce printing and mailing costs.

2. Increase OP efficiency and productivity by:

   a) Eliminating the re-entry of orders due to fatal errors or change orders.

   b) Saving the time spent researching multiple sources of data needed for data entry.

   c) Reduce redundant data entry.

   d) Increase throughput by, ease of order entry so that as order volumes increase, personpower will not have to increase proportionally.

3. Have more productive clerical, admin and sales time which is now wasted in dealing with incomplete, unmanageable or non-summarized order information.

4. Increase sales through better customer service and less customer frustration.

5. Reduce late payments and collections problems which are due to customer misunderstanding or misinterpretation of order information.

INTANGIBLE BENEFITS

1. Increase customer satisfaction through:

   a) Improved response to customer inquiries

   b) Less frustration at ambiguous information ie. multiple ship dates on coordinated deliveries

   c) More manageable acknowledgment paperwork

   d) Having more knowledgeable sales and admin personnel due to increased useful information

2. Provide job enrichment for clerical personnel by eliminating many of the routine manual entry tasks associated with order processing.

3. Improve management and control in admin and order processing through increased, summarized information.

4. Provide the basis for further enhancements and added capabilities in later phases.

DOCUMENT NAME	System Requirements Def.	APPLICATION NAME	Order Management Sys.
PART	Administrative Data	SECTION	1.0 Project Costs

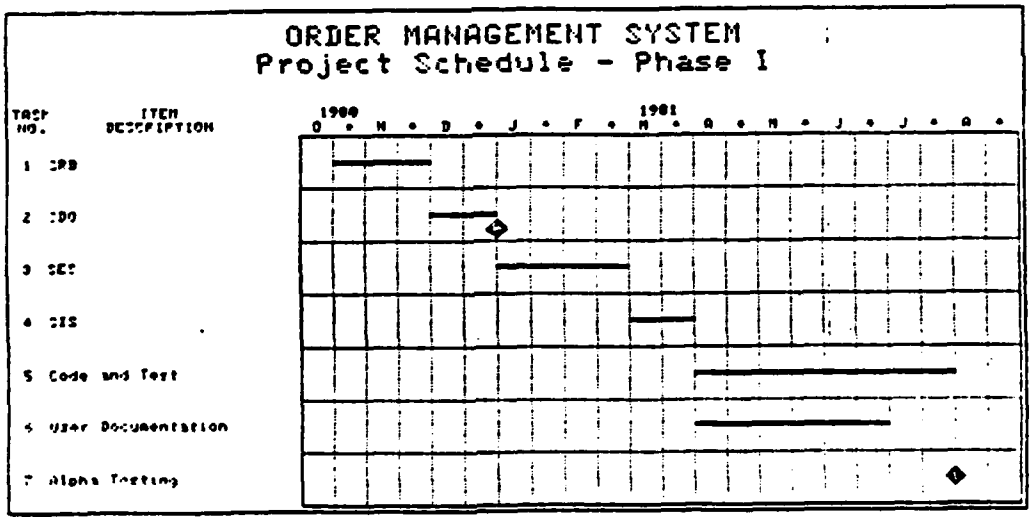
COSTING ANALYSIS

The costs below are based on an estimated $3,750/man month. This average was taken from the FY'81 targets for our department and is confirmed by targets of similar groups within our division.

Phase/ Milestone	Person Months	Cost
SRD	1 1/2	$ 5,625
SDD	5	18,750
SES	12	45,000
SIS	7	26,250
Program & Test	28	105,000
User dec	3	11,250
Implement	10	37,500
Total project cost		$ 249,375

PROPOSED SCHEDULE

Below is an estimated project schedule from project initiation in mid-October until Alpha Test the end of July. The next milestone date is the completion of the System Design Objectives (SDO) the first week of January.



DOCUMENT NAME	System Requirements Def.	APPLICATION NAME	Order Management Sys.
PART	Administrative Data	SECTION	3.0 Special Actions

SPECIAL ACTIONS

1. Before we can proceed with compiling specific System Design Objectives, we need to organize a small (5 or less) group of representative users who will agree to devote the time necessary to participate in the next design stage and critique our documents. At least one or two members should be international representatives.

2. To insure a smooth implementation, we need management to agree that our strategy for an interim customer and product file will be supported by corporate Heart, SODA and Comsys groups.

3. We must begin making plans for selecting the alpha test site. This will consist of setting forth the selection criteria, analyzing the capabilities of possible candidates, and obtaining their cooperation after the selection has been made.

CONDUCT OF STUDY

The fundamental strategy and development plan set forth in the document stems from a study conducted in 1980 by Dave Sanders et al of Computer Marketing Group and Corporate Marketing Services.

The strategy was articulated as a set of proposed Order Management System functions which were routed to sales, admin, factory, group and order processing management for review.

The objectives and functions contained in this proposal were those rated on the survey as critical by 75% to 92% of all the respondees. Our thanks for their participation go to:

Alex Woodtly/Gva
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Dave Sanders/CMG
George Radu/Corp
Bob Puette/CSD
Doug Morton/DSD
Tim McSweeney/Icon
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Carl Ingrassia/MSR
Allan Imamoto/Corp
Gary Haight/Icon
Hal Eubanks/DSD
Kathy Clark/ESR
Jack Caffey/NSR
Dave Busch/SFD
John Arserio/ESR

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